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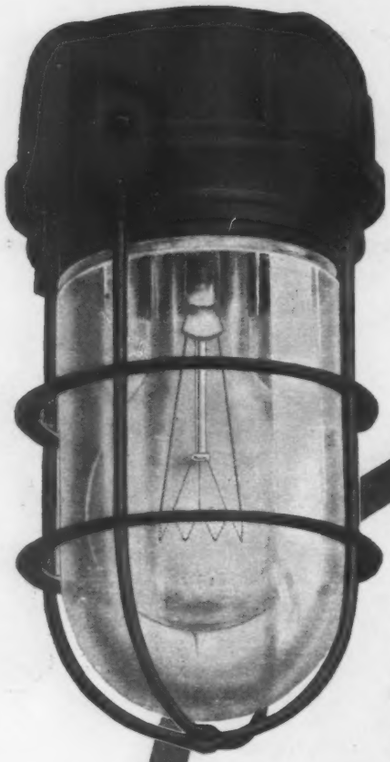

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ROBERT SIBLEY, Editor

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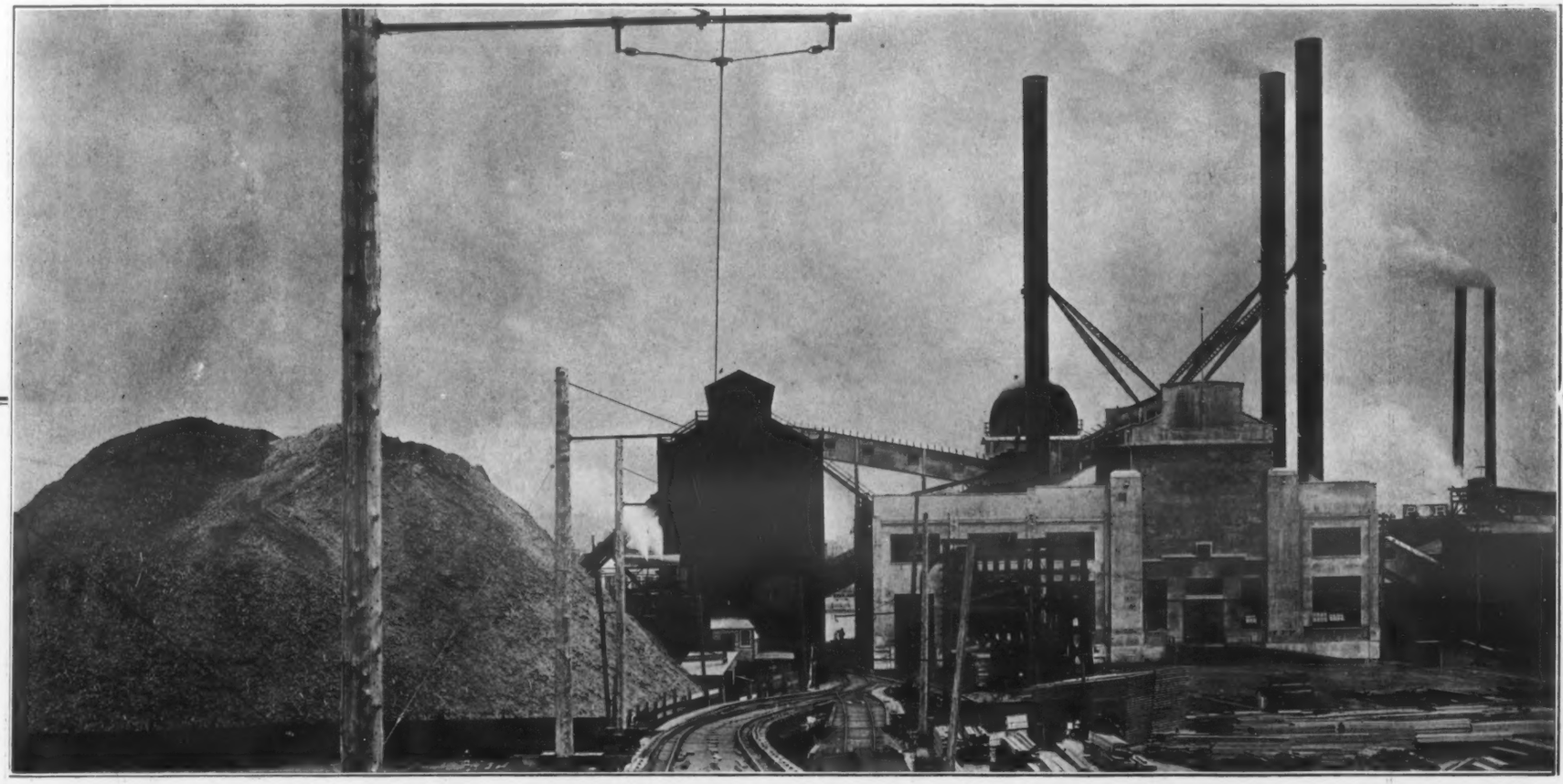

THE INSISTENT DEMAND FOR NEW FUEL

WITH oil rapidly mounting in price and being more in demand for other uses where its high heat content makes it invaluable, and coal as yet not developed in sufficient quantities on the Pacific Coast; the possibilities and economies of other fuels are receiving increased attention. The great Northwest—where the immense lumber industries preponderate—offers a solution of this problem through the use of saw mill refuse called "hogged" fuel. The plant above, that of the Northwestern Electric Company at Portland, Oregon, has been designed to utilize this fuel, and on other pages of this issue is fully described.

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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 45 SAN FRANCISCO, JULY 1, 1920 Number 1

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A WATER POWER LAW AT LAST

ON June 18 announcement was given from the office of President Wilson that the Water Power Bill had been signed as of date prior to June 11, on which date the period provided by the federal Constitution for the signing of bills passed by the closing Congress ended. In the final establishment of this law, the West, which is so directly concerned with electrical affairs, has a feeling of the greatest satisfaction. At the same time an active campaign should be launched to show those not intimately familiar with the water power situation that this bill has more direct effect on them than any other measure that has been up for consideration for many years. We of the electrical industry know full well that the unhampered development of the tremendous natural resources of the West is inseparably bound up with the development of our water power and therefore we must in nowise neglect our duty to tell this on every occasion.

At the recent Pasadena convention of the National Electric Light Association the conclusion was reached to continue in office the present Water Power Development Committee of this Association for the purpose of aiding in the formulation of regulations for the administration of the Water Power Act. To show that the industry does have such an interest in this measure, no time must be lost in this work. It is the actual interpretation and administration of this Act which will tell whether the public at large will get full value from it. This interpretation and administration must give a broad sympathy and unhampered encouragement to those who invest their monies for its fulfillment. Let us all work now to see that those broad ideals are brought into practical application.

Progress in Insulator Development

At the A. I. E. E. convention at Portland, July 21 to 24, the principal topic to be discussed is that of suspension insulators. The program committee has done well to make these plans as this subject is without doubt foremost in the minds of Western engineers at this time when the development of large water powers is being actively pressed.

Of particular interest among these papers are the ones by Professor H. J. Ryan and F. W. Peek, Jr., which cover the subject of insulator shielding. It appears that the only practical way in which the higher voltages which will be required within the next few years may be operated, is by the use of insulator strings so shielded that the unit duties imposed on any one of the units may be kept below the critical value which lies in the neighborhood of 20 kv. Above this value there is the possibility that surges on the line will increase the duty on the line unit to such a figure that this unit will arc over and, by cascading, the entire string will be shorted.

With the improvements in design outlined by Ryan and Peek the only other bar to 100 per cent insulators is refinement in manufacture. The processes now in use are satisfactory, yet the technic of firing has not reached perfection. To get this the users of insulators must be prepared to pay real money for the units put to use so that the manufacturers will be compensated for the units discarded in selection and testing.

Selection of Officers

Great care should be observed in selecting men for office. Because a man is a great engineer should not necessarily fit him for holding office. Rather is the attitude of mind of the candidate to be weighed. The gift of office is the expression of confidence on the part of the membership in the proposed candidate, looking toward enlarged opportunity for service.

The different engineering societies seem to be divided into parties, formed by geographic lines or by the different sub-divisions of that branch of the industry they formed to improve. Each branch of the industry and every section of the country should be represented on the council to uphold the position of their respective sections of the nation.

The men chosen for the executive positions should if possible be near the top in their profession and should have the highest ideals coupled with extended knowledge of all the branches of that profession. Only such a man can safely guide the organization into its place in the solution of the tremendous industrial issues precipitated by the anti-climax of the war.

The West, with its acknowledged leadership in hydroelectric development, mining operations, and large construction works, should be the logical place to find the man with the necessary requisites for the leader of an engineering society. For a man to be near the top of his profession in the West means that he must be a man of the highest ideals, with a

broad vision, and one who has met and conquered the many problems that come to the pioneer.

Let the various engineering societies in these days of unrest set themselves up as models of proper government and show, in their choice of executives, the value of the engineer in politics due to his far-sightedness in choosing the right man for the place, regardless of all else. An engineer is by nature constructive, no matter what branch of the profession he represents; therefore let him apply to his politics the same constructive vision he applies to his business and to his profession.

While, however, we advocate engineers of the West as possible candidates for office, we must not lose sight of the fact that the vast distances seperating us from Eastern centers must perhaps, for some time to come, act as a slowing-up process in bringing into full action the vision that today prevails throughout this vast domain.

Alternate Leadership

One of the most powerful new thoughts brought out at the recent Foreign Trade Convention held in San Francisco, and also at the convention of the National Electric Light Association at Pasadena, was the utterance of Henry Suzzalo, president of the University of Washington, on the subject of "Alternate Leadership"—a combination of words upon which he dwelt with considerable emphasis.

We do not understand that his use of the word "alternate" in combination with the word "leadership" is meant to convey that responsibility for citizenship is for one moment vested in one individual and the next moment in another, but rather that a reciprocal leadership in thought should be the order of the day. In order to make this possible, President Suzzalo forcefully brought home to his hearers the fact that a certain humility is necessary on the part of every citizen in his attitude toward others who are experts along certain lines of thought, and in turn these others should have a certain attitude of humility toward the speaker when he in turn speaks with authority on subjects wherein he can qualify as an expert.

The development of this ideal of alternate leadership is another phase of the great cooperative ideal that is sweeping this country, namely, that the other man and his problems and his viewpoint be given at all times the weight they deserve in any phase of the discussion. He who endeavors to sit in judgment upon every question of the day and speak authoritatively on its problems, irrespective of his qualifications to pass such judgment, cannot long retain the esteem of his fellows. President Suzzalo in this recent pronouncement of his has given us a clearer conception of an ideal of leadership toward which we may all work, endeavoring to kindle within ourselves the necessary humility willingly to hear authoritative statements of opinion on broad problems of the day from each individual citizen qualified to speak.

The electrification of railways; the economic development of our water powers; the handling of difficult and perplexing technical problems such as inductive interference on the one hand, and of the purely commercial problems such as the merchandising of electrical ware on the other,—these are all matters of great present day importance, and in the solution of these problems the executive, the business man, the engineer, each in his field, must be granted his share of alternate leadership.

The Cleaning of Boilers

In this day of scarcity of fuel oil and increasing cost of this product, power plant managers, executives and engineers will do well to give added attention to the details of boiler room operation that lead to increased economies. One instance is that of being able readily to clean the scale from boiler tubes.

There have been many compounds of a chemical nature invented to handle the various sediments and scale formation that take place in the operation of the modern steam power plant. A little common sense in the method by which the cleansing process is attacked will go a long ways toward effective results. Indeed, attention to one little detail will often soften the scale formation and will be found very effective. Thus it is found that when time permits in the operation of the steam power plant, the boiler should be left full of water for two or three days after a shutting down takes place for the cleansing process. This lying idle, as it were, prevents the scale baking to the tubes so that it remains softer and is far more easily removed. Other instances of care and patience will effect a decided improvement in the cleaning of boiler tubes and increased efficiency in the power plant.

Engineering Advice in Power Company

The power company engineer has often felt that his investigations, and the advice based upon them, which he had to offer were looked upon by the power company management as matters of interest but not of importance. If the company's lawyer comes forward with a question of policy or legality, the matter is given immediate consideration, as vitally affecting company welfare. Suggestions from the engineering department, however, have been too often pushed aside by apparently more urgent business until the results of a failure to realize the importance of a problem force it to the foreground. The imperative necessity of adopting a fixed policy on inductive interference before the attitude of greater preparedness of the telephone interests forces an entire revision of the transmission system, has called to the attention of the power company management the acuteness of some of these engineering matters. In the carrying out of the tremendous financing plans which are on the slate for the next decade, no loophole which might lead to unfortunate relations with the public should be allowed to slip by. The vigilance of every department is needed in the formulating of company policy, and none more than that of the engineer, who alone can foresee and analyze the strictly technical problems which continually arise.

Interest of Financiers in N. E. L. A.

One unexpected result of the greatest moment to the power companies of the country was achieved through the discussion of the public policies and financing at the Pasadena convention, namely, the realization by the Investment Bankers' Association of the value of a close affiliation with the National Electric Light Association; and this not with the entirely altruistic motive of benefiting the electrical industry, but in order to benefit themselves through the application of the principles of self-interest. This is a step toward the solution of the pressing problem of securing the millions of dollars so vitally needed for financing, particularly in the West. With the bankers represented on the N. E. L. A. committees, an intimate knowledge of the workings of the utilities and an understanding of their ideals will be transmitted in a way that years of propaganda work could not accomplish.

Trend of Prices

Discussions of prices, and opinions as to their probable further rise or possible decrease, have been forthcoming without limit; government agencies, commercial bodies, financiers, manufacturers and consumers have worried and studied over it—and for every guess on one side there is another and perhaps as good a guess, on the other. All this is entirely justified. With the dollar of today worth only a trifle over forty cents as compared with that of 1913 the question is of course the most vital one at this time.

A ray of hope for the struggling wage earner is seen in the slight decreases in some commodities recently, and another sign, specially interesting to the electrical industry, is the report that a number of the manufacturers of equipment have so nearly caught up with back orders that they are in a position to go after orders rather than have the orders come to them. If such continues to be the situation a decrease in prices might result from the resulting competition. In general the conclusion is reached, however, that no marked decreases will result within the next year and a half.

Constructive Commission Regulation

The great state of Montana which in past years has offered so many constructive ideas in engineering, is now, through its regulatory body, the Montana Railroad Commission, undertaking a new and helpful work. This commission during the past year has been assisting the smaller companies to run their plants more efficiently and to adjust themselves to changed conditions and high prices. Increased rates do not always solve the problem. In some cases a theoretical increase has actually resulted in a decrease in revenue. This commission has found it possible by a close study of the plants to suggest changes in methods of operation that result in a decrease of overhead expenses sufficient to make rate increases unnecessary.

This system of procedure enables the smaller companies to compete with the larger companies which are able to keep a large force of engineers who naturally institute the economies that cut down overhead expense. With the engineers of the commission performing the duties of consulting engineers for the smaller companies there will be fewer rate cases for them to investigate and fewer valuations to be made, giving them more time to be of help to the companies. Commissions were formed to protect the company and the consumer, to insure good service to the consumer at a fair rate to both producer and consumer, and to act as an impartial judge in cases of dispute. By increasing the efficiency of the companies under its jurisdiction this commission is doing a constructive work that will make its other work unnecessary and will do a lot towards bringing about a real cooperation between the consumer, the company and the commission.

Standardization in Railway Electrification

There seems to be little question in the minds of electrical men that Western railroads will eventually be electrified, the time at which this vent is to occur depending upon the moment at which the operating men of the railroads can be convinced of the economical value of this step compared to other improvements along old established lines—and, as a related factor, the rising price and scarcity of fuel.

Foreseeing that all main lines will be electrically operated within a comparatively short time, therefore, it is imperative to consider the problems which will arise from their inevitable interconnection. The electrical industry has long suffered from the fact that it realized too late that electric generation was not a local problem and that it permitted electric systems to grow up under entirely different conditions in different parts of the country, with resulting difficulties when it comes to interconnection at the present time. Electrified railroads are now in a fair way to make a similar mistake, but with the warning of the 50-60 cycle problem before them, no such barrier to future development should be permitted to develop. Not only rolling stock and engines, but power will inevitably be passed along from one section of electrified road to another. The question of standardization is one which should be studied by railroads and manufacturers alike in the interest of future needs as well as the immediate present.

A More Optimistic Outlook on the Power Situation

The power shortage which faced the whole West this season and led to the establishment of strict regulations regarding the use of power is not as great as was at first feared. This is shown by the conditions now prevailing in California where the cold weather during April and May which retarded the run-off in the mountains, and an unusually heavy snowfall in the higher elevations have brought about a more optimistic estimate of the amount of power available. The previous figure of 114,000,000 kw-hr. shortage was spread over seven months, and was about 10 per cent of the total estimated load, while the present estimated shortage of 70,000,000 kw-hr., or seven per cent, will only last six months. These figures are based upon the latest

chart prepared by the power administrator of the California Railroad Commission which is reproduced in the news columns of this issue of the Journal of Electricity.

It must be remembered, however, that these figures are based upon a most optimistic forecast of conditions, and that any unusual weather conditions might again increase the shortage. Power users that have adopted conservative measures should continue these, as any more ambitious plans would be liable to curtailment. In view of the recent agreement between the power companies of California and the power administrator not to accept any new power contracts of fifteen horsepower or over without first referring them to the power administrator, it can readily be seen that the crisis has not been passed. There is still need of conservation of power and before the summer is over certain of the non-essential users of power may be restricted. Therefore those consumers who have arranged their business to operate under the ten per cent shortage should continue to operate as heretofore, and allow those new industries which have sprung up this year to utilize any of the extra power that might be available under this new, more optimistic survey.

Watching the Chimney Gases

A record of what is taking place in the combustion chamber of the steam electric power plant is a matter of great importance in so far as the economy records of each day are concerned. Engineers will do well to see to it that the most improved methods in keeping this record are put into practice. The simple Orsat apparatus is used very extensively in many power plants. It is reliable and accurate and its only drawback is that it is a somewhat delicate instrument and requires careful manipulation.

There are on the market other instruments that are more rugged construction, and, therefore, more suitable for power plant work, by which it is possible to determine the CO_2 only. While for any scientific investigation or accurate test it is necessary to determine the oxygen and CO as well as the CO_2, there are many cases in practical operation where the determination of the CO_2 alone is very valuable; therefore, the simple instrument by which this can be done has a useful place in power plant work.

One of these instruments consists of a metallic vessel into which is pumped a charge of the flue gas to be analyzed. The vessel contains a small quantity of caustic potash solution for the purpose of absorbing the CO_2 in the sample. As soon as the gas is taken into the receiver the cocks are closed and the instrument is shaken to mix the gas thoroughly with the absorbent solution, thus removing the CO_2 content. A small amount of mineral oil floats on top of the caustic solution to keep the gas from coming in contact with the caustic until after the cocks are closed and the instrument shaken. Removing the CO_2 in the gas reduces either its volume or its pressure. In this case, the volume remains constant and consequently the removal of the CO_2 reduces the pressure in accordance with the well known Boyle's law. The reduction in pressure is measured by a small vacuum gauge which is calibrated to read in percentage of CO_2.

Another instrument is a compact portable type that operates on the same principle as the Orsat and makes accurate CO_2 determinations. There are many other types on the market that for particular instances are accurate, handy and of easy application in the power plant. No central station manager or engineer looking toward increasing economy in his power plant can afford to overlook the necessity of constant and accurate records of what is taking place in the combustion chamber.

*More than half*_____

of the industrial plants of the country are inadequately illuminated.

In the next issue, in addition to others vitally important, the subject of Better Lighting will be covered.

A new series on elementary electricity will also begin in that issue.

The city of Portland in which the 1920 Pacific Coast Convention of the A. I. E. E. will be held

Pacific Coast Convention, A. I. E. E.

(With transmission voltages reaching ever higher it is reasonable that this convention should give most emphasis to the discussion of the subject of suspension insulators. Herewith are abstracted a few of the papers which will be presented at Portland during the sessions which will extend from July 21 to 24. In order to aid in stimulating interest in this convention and increasing the attendance, the Journal of Electricity has made special arrangements to give advance publication to the papers. There will be eight convention papers.—The Editor.)

ELECTRICAL CHARACTERISTICS OF THE SUSPENSION INSULATOR

BY F. W. PEEK, JR.

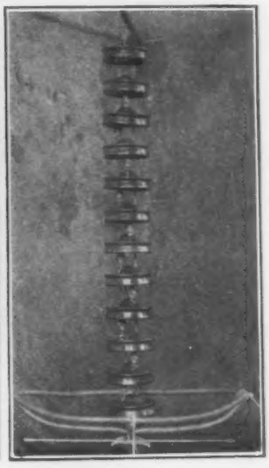
At present voltages the insulator problem is primarily a mechanical one. Due to the unreliability of porcelain in tension, the greatest care must be exercised in manufacture to secure a satisfactory product, and it has been found that even the most careful test will not eliminate deterioration after several years of use. This deterioration is due to gradual mechanical cracking or gradual absorption of moisture due to porosity, with the greater portion of the cracking caused by expansion of the cement and tight fitting metal parts. These causes of deterioration are not met with in the type of insulator in which the porcelain units are strung together by loose fitting metal parts, even though the insulators were made of poor material. The solution of the deterioration problem seems to be to start with a design as free as possible from expansion troubles and the selection of a non-porous porcelain. This selection would best be attained by testing a small percentage of the product to destruction daily.

It has been determined that insulators in series in a string have not the same arc-over voltage as the sum of the arc-over voltages of the individual units, but less. The curves of Fig. 1 show this voltage distribution. Fig. 2 shows that for strings of over five units about 30% of the total voltage is across the insulator nearest the line.

As a string of insulators may be considered as made up of a number of capacities in series, it is apparent that the capacity currents cause an unequal voltage distribution which may be corrected by increasing the capacity of the insulators without increasing the capacity to earth; by increasing the capacity of the insulators in proportion to the currents flowing through them or by elimination of the ground capacity by means of antenna shield. Of these three possibilities the third is quite practical and gives good voltage distribution.

Although heretofore the main argument given for equalizing voltage distribution has been to reduce the string length by increasing the arc-over voltage for a given number of units, it is much more impor-

Grading by metal caps



Antenna shield for equalizing the voltage on insulators

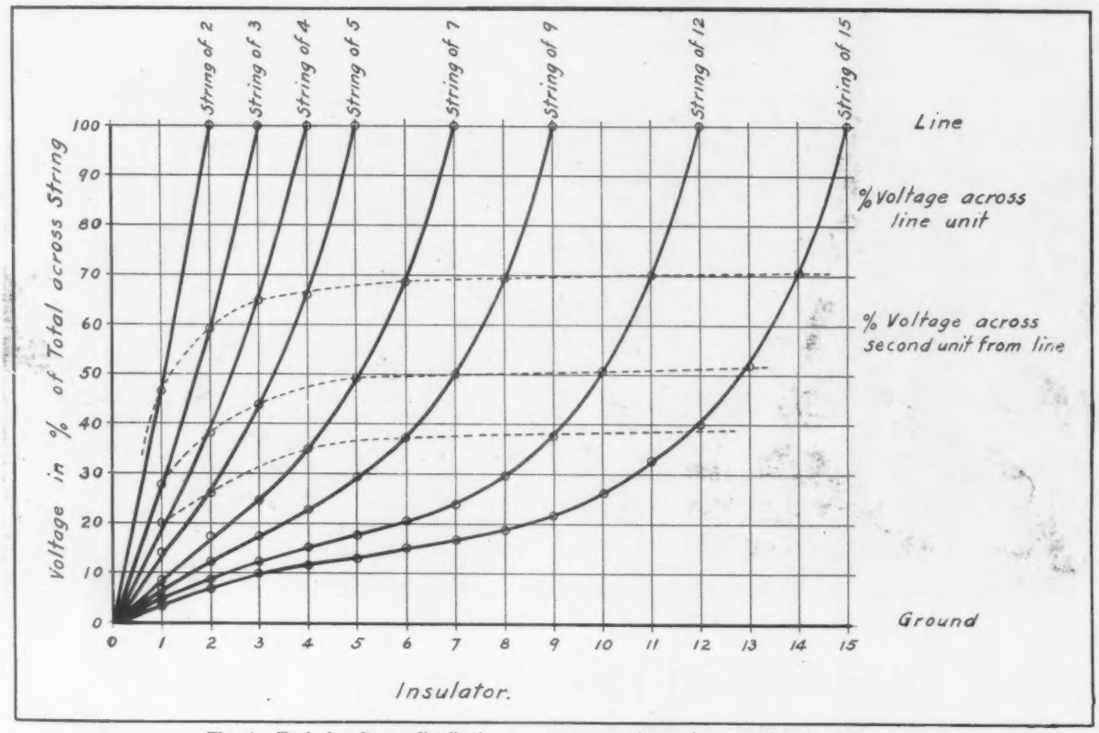


Fig. 1.—Typical voltage distribution curves on strings of suspension insulators.

tant to reduce the operating stress on the line-end units. The following points are arguments in favor of grading:

(1) A string cannot be greatly shortened in practice by grading because of the effects of rain, dirt, etc. (2) Rain would not increase the wet arc-over voltage of a graded string. (3) The wet arc-over voltage would generally be lower if the string were decreased.

There is an additional reason why grading will generally not make possible an increase in the arc-over voltage or decrease in the string length. For any un-balanced string there is more or less complete automatic grading as the arc-over voltage is approached. Near arc-over excessive corona forms on the line unit, to a less extent on the next unit, etc. These sheets of corona act as capacity plates and grade the string, thus automatically raising the arc-over voltage.

Summary.—For the very high voltages at present being considered greater reliability may in many respects be anticipated than for the lower voltage lines. The lighting arc-over voltage and dielectric strength will be relatively higher, and induced lightning voltages sufficient to cause arc-over will be less than on low voltage lines. Unequal distribution can be corrected by shielding. Shielding prevents excessive corona on the line end units, and tends to direct the power arc away from the string. The maximum unit stress on a 220-kv. shielded string can be made less than on a 100-kv. non-shielded string. And, therefore, outages due to insulator troubles will probably be less frequent at the higher voltages than at present.

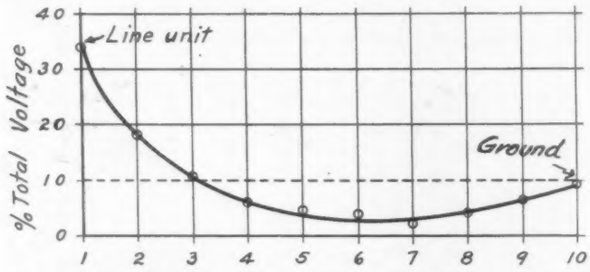


Fig. 2.—Voltage distribution curves on string of 10 insulators. 30 per cent of the duty falls on the line unit.

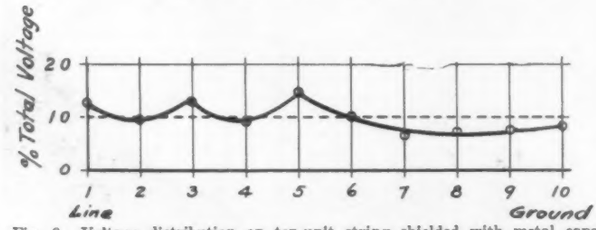


Fig. 3.—Voltage distribution on ten-unit string shielded with metal caps on units.

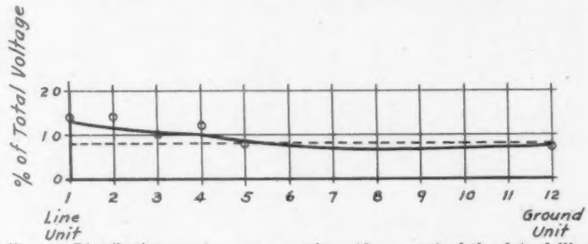


Fig. 4.—Distribution on str... units. 12 per cent of the duty falling on the line unit.

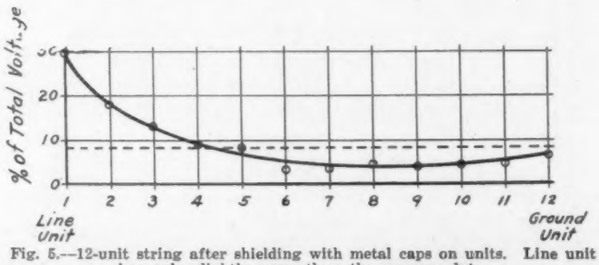


Fig. 5.—12-unit string after shielding with metal caps on units. Line unit has only slightly more than the average duty.

UNIT VOLTAGE DUTIES IN LONG SUSPENSION INSULATOR STRINGS

BY HARRIS J. RYAN AND HENRY H. HENLINE

This paper deals with potentiometer measurements of the maximum and average unit voltage duties occurring in insulator strings made up of 10-in. bomb and link type units in which the relation between the unit maximum voltage duty, number of units in the string and three-phase line voltage is given by the equation:

$$e_{md} = \frac{d_r\, e}{1.73_n}$$

wherein e = three-phase line voltage
e_{md} = maximum voltage unit duty
n = number of units in string
d_r = corresponding duty-ratio.

By means of this equation duties were determined for line voltages of 110, 150, 175, and 220 kv.

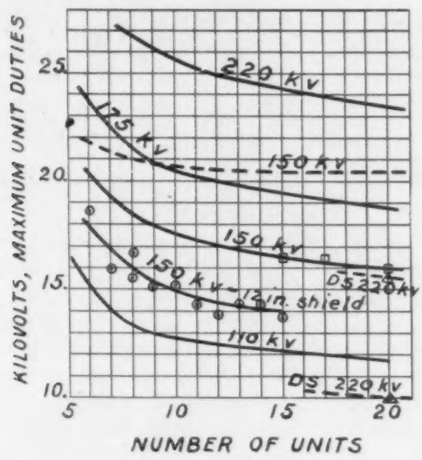


Fig. 1.—Maximum unit duties in kilovolts for various length strings and line voltages, for both shielded and unshielded units.

An inspection of the curves in Fig. 1 of the value derived in the above manner reveals the fact that when maximum and average voltage unit-duties are assumed to be limited to 18 and 10 kv. respectively, the upper limit of line voltage will be 150 kv. Increasing the number of units from 9 to 20 will lower the maximum voltage from 18 to 16 kv. only. An increase in string length from 10 to 20 units will cause a corresponding increase in flash-over voltage of only 9 per cent.

When used to support and insulate a 220-kv. line a 13-unit cap and pin string would operate at maximum and average voltage duties of 25 and 10 kv. respectively. Many engineers feel that a duty of 25 kv. for a single 10-in. unit is too high because of corona formation and the lowered factor of safety against flash-over by cascading. This latter factor shows the value of a radical departure in the design and construction of the units whereby they would endure satisfactorily under higher maximum voltages. It is generally conceded, therefore, that in the present state of the art some additional means must be employed in suspension insulators for the 220-kv. or 250 kv. lines whereby the maximum unit-duties will not be excessive.

These maximum duties may be lowered by one or more of the following expedients:

I. Increase in size and capacitance of some or all of the units; grading.
II. Increase in the number of strings in the insulators.
III. Use of static shields.

A large number of measurements have been made by the authors for the purpose of illustrating the effect that the use of a small static shield would have upon the maximum voltage duty in a single string.

It appears that the ten 10-in. cap and pin unit string equipped with a 12-in. static shield would serve as satisfactorily for the insulation of a 175-kv. line as the corresponding nine-unit string without shield now serves on a 150-kv. lone.

It is seen that by the practicable expedient of increasing the capacitance of the units the maximum voltage duty in the long string may be lowered from 30 to 11 kv. with an average voltage duty of 10 kv.

Not until the manufacturer has amply demonstrated, by economic quantity production, his immediate readiness to deliver durable units in which radical changes have been made in design, size, and mechanical and electrical duty resulting in extra high voltage line insulators having an aggregate superiority in essential qualities over those made at present, can the transmission engineer count upon the use of units materially different from those in use for the support of extra high voltage lines.

A great number of tests of the maximum and average voltage unit duties in line suspension insulators made up of units in common use have been made. Duties values have been plotted for single and double strings with and without shields, the latter of various dimensions for voltages of 173 kv. and 208 kv.

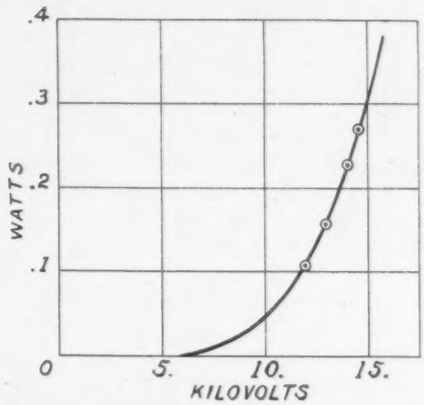


Fig. 2.—Power loss in 10-in. units for various unit duties.

Conclusions: 1. Suspension insulator units in common use can be satisfactorily employed for the make-up of insulators for 250 kv. lines. 2. Increase in the number of units in suspension strings will permit the use of a limited increase in line voltage. 3. Static shields in requisite forms will lower the maximum unit voltage duties so as to permit the satisfactory insulation of lines for the use of voltages far above 150 kv.

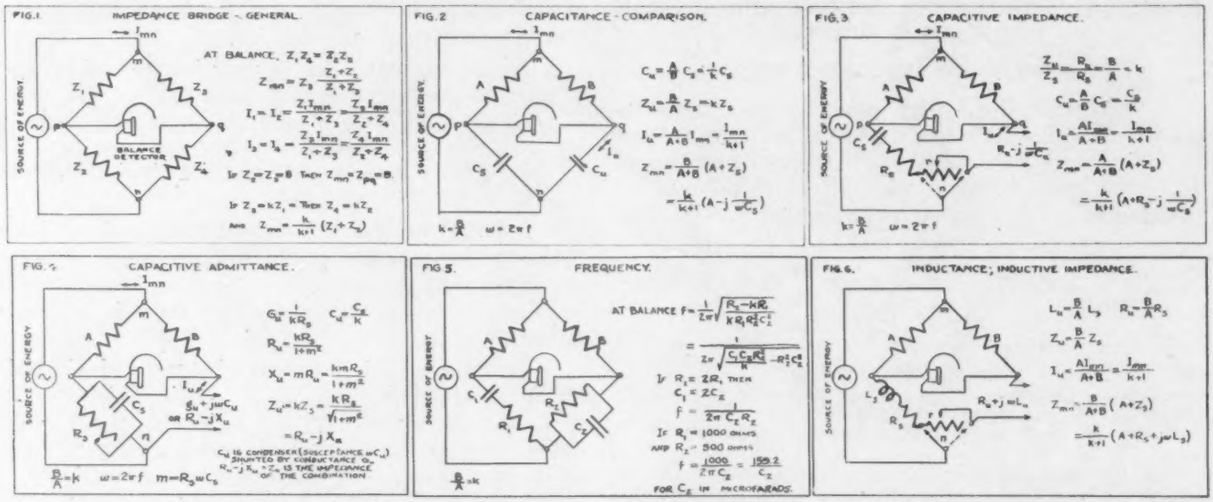


FIG. 1 IMPEDANCE BRIDGE - GENERAL.
AT BALANCE, $Z_1Z_4 = Z_2Z_3$
FIG. 2 CAPACITANCE - COMPARISON.
FIG. 3 CAPACITIVE IMPEDANCE.
FIG. 4 CAPACITIVE ADMITTANCE.
FIG. 5 FREQUENCY.
FIG. 6. INDUCTANCE; INDUCTIVE IMPEDANCE.

Charts showing the six outstanding arrangements used in the so-called bridge method of testing which stands out above all others in the history of electrical measurements

BRIDGE METHODS FOR ALTERNATING CURRENT MEASUREMENTS

BY D. I. CONE

Eminent in the history of electrical measurements is the so-called bridge method of testing, the fundamental principle of which is the equalization of the potentials of two chosen points in a network of electric circuits. The original application of this principle was made in 1833 to the measurement of resistance to direct current in the arrangement long familiarly known as the Wheatstone bridge. Later developments cover the application of the bridge principle to the measurement of impedances of alternating current circuits. However, the Wheatstone bridge, as used with direct current can be used for alternating current testing by applying the principle that all the numerical formulas and rules of quantitative behavior for continuous current circuits are exactly the same as for a single frequency alternating current circuit, if these rules are interpreted as relating to complex numbers.

The first consideration in the use of practical forms of bridge work in alternating current testing is the replacement of the four resistances of the direct current Wheatstone bridge by impedances. In place of resistance is written the impedance

$$Z = \sqrt{R^2 + X^2} \qquad \theta = R + jX$$

Where R = effective resistance

X = effective reactance (+ if inductive, — if capacitative)

$$\theta = \tan^{-1} \frac{X}{R}$$

The arrangements used in practice to secure greatest sensitivity for a given departure from the balanced condition depends upon the impedances of the branches, including the balance detector and energy source and the kind of circuit being measured.

Of the various bridge arrangements given in the paper, the following may be noted:

1. Impedance bridge general.
2. Capacitance comparison as arranged by De Sauty.
3. Capacitive impedance as arranged by Wien, the latter where the power factors of the standard and unknown condensers are different and in general for measurement of capacitive impedance, including both resistance and capacitive reactance components.
4. Capacitive admittance where the standard resistance and condenser are in parallel which may be designated as an admittance bridge.
5. Frequency bridge using resistance and capacitance only connected in series on one side and in parallel on the other.
6. Inductive impedance for the direct comparison of inductances and the measurement of inductive impedances.

Other methods of bridge measurement are shown as alternates to the above for the measurement of factors less often encountered in practice, such as capacitive or inductive impedance, inductive or capacitive impedance, mutual inductance-capacitance-frequency and others.

SAW MILL REFUSE, POWDERED COAL AND OIL FUELS

BY DARRAH CORBET

(This paper gathers together such data as is available on the subject of the utilization of saw mill refuse, together with notes on powdered coal and oil fuel. As the latter two fuels have been treated extensively in the past, only the first has been covered in this brief abstract.—The Editor.)

Saw mill refuse consists of wood of every kind and size, from the finest dust to blocks as large as a 12-in. cube. The present practice is to run these larger blocks through a "hog" which cuts them up into chips the size of one's finger, thereby obtaining a more uniformly sized fuel.

Characteristics of Principal Western Mill-Refuse Fuel

Name of Wood	Location	Percentage moisture	Fuel value
Cedar	Western Wash., Ore. & B. C.	45—55	Fair
Cedar	Central California	40—50	Fair
Fir	Wash., Ore. & B. C.	35—45	Good
Fir	Central California	35—50	Poor
Hemlock	Wash., Ore. & B. C.	40—50	Poor
Pine—cork	Eastern Wash. & Idaho	35—45	Fair
" white	California	30—45	Fair
" sugar	California	40—65	Poor
" yellow	Central California	40—45	Fair
Redwood	California	45—50	Poor

The above table refers only to the moisture content, and it is interesting to note that the dry, non-resinous woods have practically the same heat content—8500 B.t.u. per pound.

One of the reasons why mill refuse has not been used more extensively is the difficulty of transportation. Only recently has it been transported any distance and even now seldom over 100 miles, the chief obstacle being the difficulty of getting an economical load on the cars or barges due to the lightness of the fuel. The best method evolved for moving this fuel over short distances has been to scrape it over smooth surfaces or blow it through pipes. Conveyors are less satisfactory, except in some instances in moving the fuel from the pile to the boilers.

In the storage of this fuel it has been found best to store it in the open, using some means of reclaiming it later, as long stacking causes it to pack. The two largest outdoor storages yet tried are at Station L of the Portland Railway, Light & Power Company and the new plant of the Northwestern Electric Company. Storage in the open has not been found to spoil the fuel, although it increases the moisture content. This latter may, however, be easily corrected.

Furnace Details

In the firing of hogged fuel the simplest method, and the most economical from a labor standpoint, is to run it into the furnace in a continuous stream, letting it pile up on the grate, either using one or two piles as conditions warrant. The ideal furnace design is one 6-ft. wide, although furnaces up to 12-ft. length have been successful. As high furnace temperatures are desirable in using this fuel, the throat of the furnace should be restricted by running the bridge wall up as high as possible without interfering with the draft; the area of throat left should be from 6 to 14 sq. in. per rated horsepower. A combustion space should be provided back of the furnace as hogged fuel has a large volatile content and tuyeres and a door or damper to control the admission of air must also be provided. Under any circumstances the arch should extend beyond the point where the supplementary air is admitted.

The following results of one test from among a number run on Station L of the Portland Railway, Light & Power Company give a good conception of the use of this kind of fuel. This test is the one which gave the best results; some other final results are given for comparison.

Test at Station L of Portland Railway, Light & Power Co.	
Kind of boiler	B & W.
Kind of firing	Riley stoker
Grate surface	114.5 sq. ft.
Date	Mar. 12, 1920
Duration	6 hours
Steam pressure	187 lb.
Temperature of steam	572° F.
Weight of fuel as fired	49,961 lb.
Total equiv. evaporation	164,068 lb.
Dry fuel per hour	5,395.8 lb.
Dry fuel per hour per sq. ft. grate	48 lb.
Equiv. evaporation per hour	27,344.6 lb.
Equiv. evap. per hr. per sq. ft. heating surf.	6.16 lb.
Percentage of rated capacity developed	178%
Equiv. evaporation per lb. of dry fuel	5.06 lb.
Equiv. evaporation per lb. of combustible	5.32 lb.
Efficiency of boiler, furnace and grate	60.1%
Efficiency based on combustible	58.5%

The following are comparative results of some of the other tests made on the same plant. The principal variants in the tests were the kind of firing and arrangements of furnace, all these tests being run with extended Dutch ovens.

	Test No.1	Test No. 2	Test No. 8
Percentage of rated capacity	114%	91.8%	158%
Equiv. evap. per lb. of combustible	3.65 lb.	4.95 lb.	4.31 lb.
Efficiency of boiler, furnace and grate	38.4%	53.7%	47.7%
Efficiency based on combustible	38.5%	54.6%	47.2%
Kind of firing	double chute	hand fired	four chutes
Arrangement of furnace	normal	short grates, low bridge	short grates, bridge curtain walls

This paper includes a curve of comparative values of wood and oil fuel; with cost of wood or oil up to $3.40 per bbl. or per unit of 200 lb. A typical calculation from this curve includes evaporation per lb. of oil, cost per bbl., and the per cent moisture in the mill refuse. $1.00 oil is found to equal hogged fuel at $2.25 per unit and $2.00 oil to equal $4.50 hogged fuel.

Instances are found where the smaller users of power such as laundries have found a decided advantage in the use of hogged fuel even though they have it brought to them in trucks. This makes a comparatively expensive method of handling this fuel but the net result is still in its favor due to the present high prices of oil and coal.

Although the installation of stokers for the handling of hogged fuel does not seem warranted by the added economy to be gained, yet the fact that this fuel may be handled by stokers with equal ease to coal is of the greatest interest in that it is thereby indicated that a quick shift may be made from coal to hogged fuel without any great loss in economy. In the case of the Portland Railway, Light and Power Company, the stokers were supplemented with additional fuel fed from overhead chutes.

ANOTHER SERIES BY BLISS

In the next issue will be found the first article of another series by Professor H. H. Bliss, who will be remembered as the author of the series of articles on "Practical Lessons in Electricity," which were found of such value to men in all branches of the industry. The new series is entitled "Electrical Calculations" and it is intended to fix the ideas taught in the "Practical Lessons in Electricity" by giving practical problems to be solved. The answer to the problems in each article will appear in the one following so that the student will have a chance to work out the problems and get his own solution and answers before seeing how the author has worked out the answer.

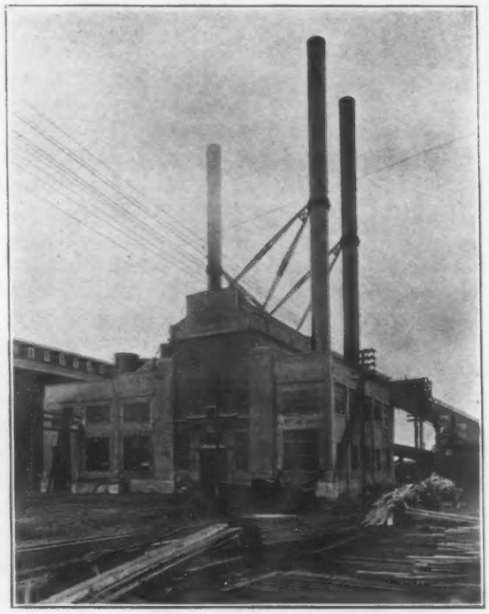
For those subscribers of the Journal of Electricity who desire to carry on the work in this series and who have not a copy of the "Practical Lessons in Electricity" to help them, a limited number of reprints of Professor Bliss's articles have been made which can be obtained by requesting them from the Journal of Electricity. Look for "RELATIONS IN THE SIMPLE CIRCUIT" in the July 15th issue of the Journal of Electricity.

New Portland Steam Plant

BY E. E. FOOTE

(One of the most interesting of the later installations on the Pacific Coast is that of the Northwestern Electric Company's new steam plant at Portland, Oregon. The electrical features of this plant, which are of unusual interest, have been described by the superintendent of the Portland Station of the Northwestern Electric Company.—The Editor.)

The present tendency toward simplification of generating plant wiring, with a view to obtaining greater ease of control and lessening the maintenance expense, is well exemplified in the new 10,000-kva. steam plant of the Northwestern Electric Company at Portland, Oregon.



The new 10,000-kva. steam plant of the Northwestern Electric Company at Portland.

Although the main wiring of the station is of the usual type—consisting of connections from the generator through auto-transformers to the double 11,000-volt bus with oil switches connected to either bus and the lines being taken off the bus in a similar way—the features of most particular interest are those of the synchronizing and control circuits, as shown by accompanying cuts. Of equal importance is the fact that this plant is designed to use saw mill refuse called hogged fuel, with the provision to use fuel oil in emergencies.

Up to the close of 1917 the generating equipment of the company consisted of a ?,000-hp. hydro-electric development on the White Salmon River in Washington and the Pittock station situated in the heart of the business district of Portland, this latter station being a combination of central station steam-heating and electric generating plant. As this plant was committed to the use of oil as fuel, due to its location, it was deemed undesirable, in face of the rising price of oil, to make further additions to this plant.

The new plant is situated on the Willamette River and is adjacent to one of the largest saw mills in the Portland district. It is connected to the steam distribution system by a twelve-inch high pressure steam transmission line in addition to its connections with the electrical system.

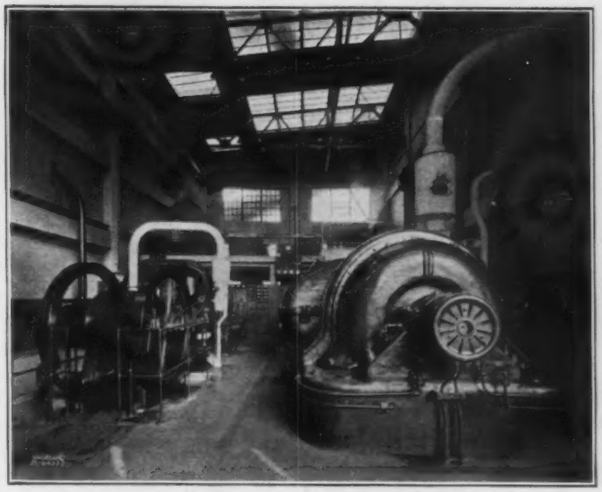
The station was designed for an ultimate capacity of 30,000 kva. to be developed in steps of 10,000 kva. At the present time one generator has been installed having a rating of 9,375 kva.

As illustrated, the switchboard, exciters, battery charging source, instrument transformers and all disconnecting switches are on the generator floor. This arrangement was made in order to minimize the number of operators required to handle the station, and this arrangement permits the operator to change busses, control the operation of the machine, and keep a close watch over the auxiliary apparatus with a minimum of exertion. The oil switches, storage batteries, station light and power transformers, and main generator field rheostat are located on the balcony. The rheostat is placed near the front of the balcony in order to be in view of the operator.

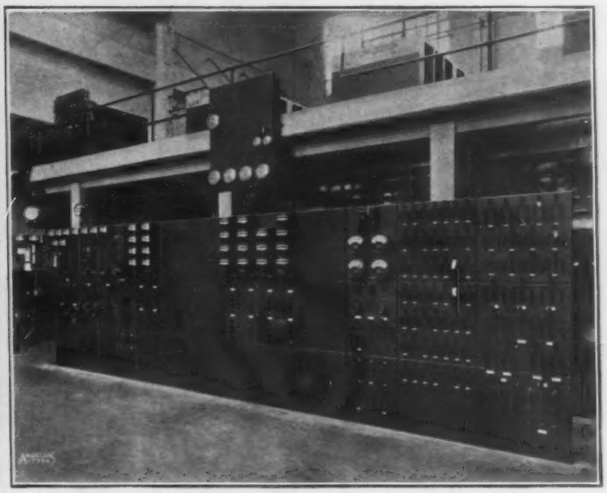
The switch cells and switches are arranged in three sections of five circuits each designated as the generator section, the tie section and the feeder section.

View under switch gallery showing arrangement of bus bars, disconnecting switches, potential transformers and pot heads.

On the main floor behind the switchboard at the end of each switch section is a terminal board. The instrument and control wires of all of the five circuits of one group terminate at this board, on which are



View looking east in main generator room, showing the switch gallery, steam instrument board and station lighting.



The main switchboard. This is located on the generator floor in order to minimize the number of operators required.

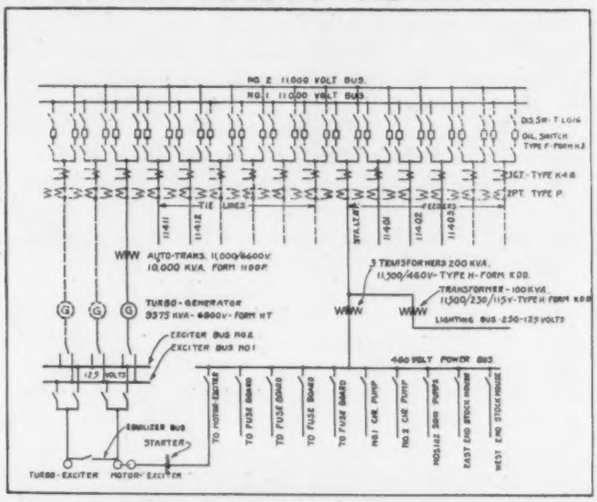
mounted the relays and integrating meters for the group. One unusual detail is that the instrument and control wires leading from the main switchboard control panels to the terminal board may be transferred to any circuit in one of the three sections without the necessity of cutting any wires. This means that a feeder position on the main switchboard can be changed without any difficulty or great expense. Special jumpers are provided on the back of the board which may be removed for meter testing without interference with the wiring.

Of the turbine auxiliaries, only the circulating pumps are electrically driven. Two of these are provided for the turbine, one a twenty-inch and one a twenty-four inch pump, which are used alternately depending upon the load on the turbine, the smaller pump being used when the load is less than 6,000 kilowatts.

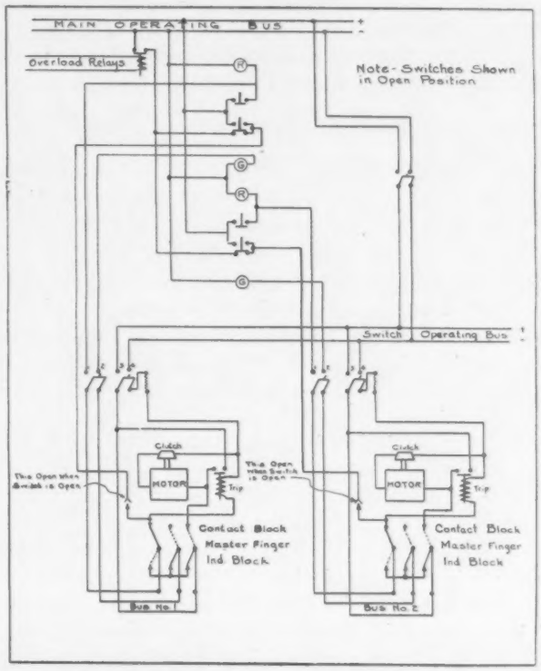
Cooling water for the bearings and transformers flows by gravity from tanks placed on the roof, to which the water is pumped through an inter-cooler by two and one-half inch centrifugal pumps automatically controlled by float switches. Duplicate float switches are provided in order to prevent damage in the event that one switch fails to act.

The auto-transformers which connect the 6900-volt generator to the 11,000-volt bus have the neutral grounded, thereby stabilizing the voltage of the system with reference to the ground, as this is the only ground on the system. The excitation of the generator is obtained from a compound wound interpole, 125-volt generator, driven by a non-condensing Curtis turbine through a reducing gear. An auxiliary exciter driven by an a.c. motor is also provided.

The usual equipment of meters is installed on the 13 panel boards, the equipment of a standard line panel consisting of an indicating wattmeter, a wattless kva. meter, an ammeter, voltmeter, and integrating wattmeters with ratchets for registering input or output.



Single line diagram of electrical connections



Wiring diagram of switch control on the lines and feeders

A. H. Babcock, former vice-president A. I. E. E., chief electrical engineer Southern Pacific Company, San Francisco.

F. G. Baum, former vice-president A. I. E. E., consulting engineer Pacific Gas & Electric Co., San Francisco.

C. A. Copeland, chairman Los Angeles Section, A. I. E. E., electrical engineer Los Angeles Bureau of Power & Light, Los Angeles.

F. G. Cottrell, director A. I. M. & M. E., acting director U. S. Bureau of Mines.

THE WESTERN ENGINEER

FROM Mexico to Canada and from the Golden Gate to Pike's Peak are included some of the greatest extremes in the geography of the country: the highest mountain and the lowest valley; the hottest climate and some of the coldest; the dryest deserts and the land of the greatest rainfall. But this whole empire is joined in one common problem; one development of science underlies the entire economic structure—namely, electricity. In this region is the birthplace and the rearing ground of most of the daring ideas in the electrical industry. The world is watching, as it has watched for years, to see what will be the next conception to be brought forth in the West. What will the West do next in the way of huge reservoirs, high dams, long water conduits, or advanced steps in electrical fields? The answers to these questions, which are of the most intense interest to the industries, not only of the West, but to the nation as a whole, lie with the engineers of this section. The engineers and not the commercial men or the financiers, will have to solve these issues.

But the engineers have not neglected their other duties to the state. They are looking about for means to improve civic conditions.

The following brief descriptions outline the history and aims of a few of the most representative engineering organizations of the West. Mention should be made of the many sections and branches of the national engineering societies which take such a great part in this work. These sections and branches deal with the more specialized problems which confront the several engineering branches, and the results of their labors are legion. Engineering organizations other than those noted have a substantial share in the toil, and it is hoped that due recognition may be given to them later. Engineers other than those pictured have had probably as great or greater influence on the progress which has been made. Herewith are only a few of these engineers. These have achieved greatest prominence through the fact that they hold, or have held, important offices in the engineering societies, where they have had opportunity to show their ability.

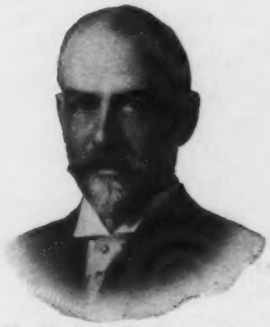
AFFILIATION OF SPOKANE ENGINEERS

Five and a half years ago at the suggestion of J. B. Fisken, consulting engineer of the Washington Water Power Company and Fellow of the A. I. E. E., the several local chapters of the National Engineering Societies formed a body called Associated Engineers of Spokane. This organization has become a local engineering council or clearing house and embodies exclusively the non-technical activities of the local chapters.

The Association is composed of members of any one of the regular national societies, the only other requirement being payment of annual dues of $2.00. The executive board of the Associated Engineers is composed of four members from each of the several local engineering societies, each society chapter having an equal voice in Association affairs irrespective of the size of its local membership list.

Some of the work of the Association has been that of helping unemployed members secure positions; it has helped to secure increased wages for underpaid members; it has kept the hand of fellowship from becoming atrophied; it has secured the appointment of engineer members on local, county or state boards of which engineers should be members; it has assisted in the rescuing of public work from the maladministration of politicians; it discourages the meticulous and exposes the meretricious in public engineering projects; it has assisted in guiding and educating the public in the formation of public policies concerning proposed work where engineering features are involved; it has assisted in educating county commissioners throughout the state in the desirability and economy of employing capable engineers at proper salaries commensurate with the duties, and it protects its members from arbitrary discharge by political officers for whom they may be working.

At the present time the Associated Engineers of Spokane are considering the advisability of creating



W. F. Durand, former vice-president A. S. M. E., professor of mechanical engineering, Stanford University.

E. O. Eastwood, chairman Washington Section A. S. M. E., professor mechanical engineering, University of Washington, Seattle.

J. B. Fisken, president Northwest Electric Light Ass'n, and vice-president A. I. E. E., consulting engineer Washington Water Power Co., Spokane.

C. E. Grunsky, director A. S. C. E., consulting civil engineer, San Francisco.

a new class of members called "Staff" members, to be composed of draftsmen, instrument men, etc., who are too old to be Juniors and who are not qualified to become members of the national societies.

At present the officers of the Association are as follows: L. K. Armstrong, member A. I. M. E., president; A. D. Butler, member Am. Soc. C. E., secretary.

OREGON TECHNICAL COUNCIL

On February 20, 1920, representatives of the American Society of Civil Engineers, American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Institute of Architects, Northwest Association of Highway Engineers and of the National Electric Light Association, met and adopted a constitution for the formation of a society to be known as the Oregon Technical Council.

The purpose of the Council is to coordinate the work of the various scientific technical and engineering organizations, to promote the welfare and professional standing of their members and to foster a more general recognition of the engineer in civic matters.

The Council is to be composed of two representatives from the local Sections of each of the National Engineering Societies as noted above. In addition to this other technical, scientific or engineering organizations may secure membership in the Council by the election of the Council.

As planned at the present time, regular sessions of the Council shall be held once a month at various places for the consideration of matters affecting the general welfare of the engineers in the territory contiguous to Portland.

THE JOINT COMMITTEE OF LOS ANGELES

BY GEORGE A. DAMON

The Joint Committee of the Technical Societies of Los Angeles is a growing organization of five summers. It measures its age by the mid-year period, for one of the unique features of this association is that it continues its weekly luncheons right through the summer months. The fact that the interest in the Thursday noon meetings continues throughout the whole year is the best evidence of the vitality of the bond which joins the technical men of southern California together in this enterprise.

The formal part of this joint organization consists of a committee composed of the chairman and two appointed members from each of the seven national societies, namely: Am. Chem. Society, A. I. A., A. I. E. E., A. I. M. E., A. S. C. E., A. S. M. E. and A. A. E.

The purpose of this Joint Committee is the consideration of matters of concern common to all of the societies. An annual dinner with an average attendance of about 300 and with eminent speakers is an established custom. The committee endeavors to prevent conflicts in the program of monthly meetings of the member societies, and also frequently arranges joint meetings for the discussion of technical questions of general engineering interest.

The real human, interesting part of the association, however, is the arrangement for a weekly lunch-

H. C. Hoover, president A. I. M. E., consulting mining engineer.

E. C. Hutchinson, president San Francisco Engineers' Club, chief engineer Pelton Water Wheel Co., San Francisco.

E. C. Jones, vice-president A. S. M. E., consulting gas engineer, San Francisco.

L. R. Jorgensen, vice-president A. I. E. E., consulting electrical engineer, San Francisco.

J. A. Lighthipe, former vice-president A. I. E. E., chief electrical engineer Southern California Edison Co., Los Angeles.

C. E. Magnussen, vice-president A. I. E. E., professor electrical engineering University of Washington, Seattle.

C. D. Marx, former president A. S. C. E., professor civil engineering, Stanford University.

L. H. Newbert, president Pacific Coast Section N. E. L. A., commercial manager Pacific Gas & Electric Co., San Francisco.

eon, which is attended by from 30 to 60 men every Thursday noon. Here we have the personal touch and good fellowship of kindred spirits all working together in one common profession. The thirty-minute talks following the luncheon are pages from the personal experiences of active technical workers in different lines and are usually followed by questions and discussion. The societies, in rotation, furnish the chairman and speaker of the day. The programs are not usually announced, as the surprise element is found attractive.

Visiting engineers are given a welcome to our genial gatherings, and men of eminence with a real message are often our guests. But what we appreciate fully as much is to have one of our own fellows tell us some of the difficulties he has recently overcome in connection with his technical duties.

Our members are interested in the building up of this great country with its numerous cities and varied activities. Through the medium of these short personal talks, we endeavor to keep in touch with such enterprises as the development of our public water systems, our hydroelectric systems, our industrial enterprises, our flood control efforts, our harbor plans, our transportation problem, our city plan proposals, our good road improvements, our architectural advancement, our sanitary arrangements and all kindred subjects of education, research, management and even industrial democracy, and the welfare of the engineer. There seems to be no limit to the common interests which draw us together for both information and inspiration.

JOINT COUNCIL OF ENGINEERING SOCIETIES OF SAN FRANCISCO

The Joint Council of the Engineering Societies of San Francisco represents the local sections of the American Society of Mechanical Engineers, the American Society of Civil Engineers, the American Institute of Electrical Engineers, the American Society of Mining Engineers and the American Chemical Society. It was formed for the purpose of furthering the common interests of the members of the engineering profession in San Francisco and vicinity, and for the rendering of public service as opportunity is afforded.

The five Sections of the National Society are represented in the Council by five officers, elected annually, who constitute an executive committee to act for the Council on matters that do not require the action of the entire body. Regular meetings of the full Council are held once a month.

Perhaps the best idea of the purpose of the organization can be given by a statement of some of the matters thus far undertaken. (1) The secretaries of the several local sections have met and agreed upon non-conflicting dates for their separate regular society meetings and have laid out an ambitious schedule of joint meetings to occur quarterly. (2) There is being established an engineer's service bureau which is intended to be a clearing house where employer and applicant can be brought together effectively. This will be a combination and an expansion of the employment bureaus now con-

G. E. Quinan, chairman Seattle Section A. I. E. E., chief electrical engineer, Puget Sound Power & Light Co., Seattle.

E. O. Shreve, president San Francisco Electrical Development League, San Francisco manager General Electric Company.

W. G. Vincent, Jr., chairman San Francisco Section A. I. E. E., valuation engineer Pacific Gas & Electric Co., San Francisco.

C. R. Weymouth, former manager A. S. M. E., chief engineer Chas. C. Moore & Co., San Francisco.

ducted independently by some of the society sections. (3) Joint Council committees have brought about the cooperation of the several sections to the end that labor and clerical expense of the secretaries' offices will be reduced. This by the joint use of addressographs, etc. (4) The Council is coordinating the efforts of the entire membership of the five sections, totaling nearly 1000 engineers resident in central and northern California, in the movement to secure the appointment of an engineer to any vacancy occurring on the state commissions.

Of particular interest is the Service Bureau of the San Francisco Joint Council which is established at the quarters of the Engineers' Club of San Francisco. This service is rendered free, both to engineers seeking employment and to employers seeking the services of engineers.

SAN FRANCISCO ELECTRICAL DEVELOPMENT LEAGUE

Remarkable not only because it has had such a rapid growth, but because it has maintained its identity through the years, is the San Francisco Electrical Development League which at the present time has a membership of approximately 335 men prominent in the industry in the Bay region.

In the spring of 1912 a handful of the leaders in the electrical field in San Francisco gathered together with the determination to form a society which would join with still stronger bonds those who had the well-being of the industry at heart. They thought that there was a fertile field for the development of an organization which would combine in proper proportions not only the more technical phases of the industry but a large share of the activities in which the engineer, the salesman, the manager and the manufacturer should unite to secure the most desirable results in civic affairs as well as general business welfare.

From this beginning the League has reached such a size that it is now the second largest lunch club in San Francisco and has an average attendance of over 150 at its weekly meetings.

The League has taken an active part in supporting electrical affairs of all kinds such as the Cooperative Campaign, the Electrical Home and the various electrical conventions.

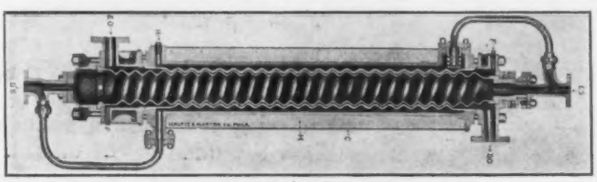
Fuel Oil Heaters and Other Accessories

BY ROBERT SIBLEY AND C. H. DELANY

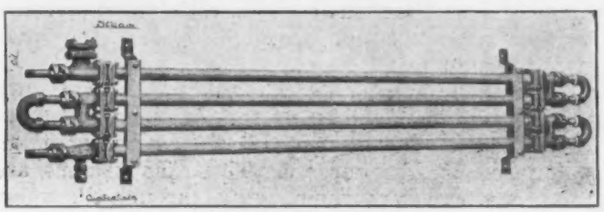
(Fuel oil heaters, oil burners, oil piping, and automatic regulators are factors of prime importance in present day steam electric generation in power plant where oil is used as fuel. The following article, written by the authors of the well-known book on "Fuel Oil and Steam Engineering," should prove of great timely helpfulness throughout the West in those steam electric power plants which are at present oil fired.—The Editor.)

Oil Heaters.—Before reaching the oil burners the oil must be passed through an oil heater to bring it up to a temperature suitable for atomizing. The oil heater is usually placed between the pump and the oil burners, a convenient method being to mount the pumps over the heater, the exhaust steam from the pump being utilized as the heating medium.

Heaters invariably consist of a series of tubes or coils with oil on one side of the metal and steam on the other, the heat passing through the metal from the steam to the oil. There are several different ways in which this may be accomplished; thus the heating surface may be composed of either a coil or a number of straight tubes; the oil may flow through the tubes with the steam outside, or the oil may surround the tubes with the steam on the inside. All of these methods are used in different heaters now on the market.



The Schutte and Koerting fuel oil heater



The "Coen" multiunit oil heater

The size of heater is determined by the formula

$$S = H\ K\ (t_s - t_o)$$

where S = heating surface in square feet
H = heat absorbed in B.t.u. per hour
K = coefficient of heat transfer
= B.t.u. absorbed per hour per square foot per degree difference in temperature
t_s = mean temperature of steam, Deg. F.
t_o = mean temperature of oil, Deg. F.

The quantity H, heat absorbed per hour, is found readily by the formula

$$H = W\ (t_2 - t_1)c$$

Where H = weight of oil heated per hour in pounds
t_1 = initial temperature of oil, degree F.
t_2 = final temperature of oil, degrees F.
c = specific heat of oil, = 0.498.

The quantity K, coefficient of heat transfer, varies with the difference in temperature between the steam and the oil, and with the velocity of oil in passing through or around the tubes. This velocity is of great importance, as the greater the velocity the better is the oil scraped from the side of the tube, thus allowing the colder oil to come in contact with the hot surface. It is evident, therefore, that a high velocity of oil is desirable. There is a limit, however, to the velocity attainable, as the higher the velocity the greater is the drop in pressure of the oil in passing through the heater. The drop in

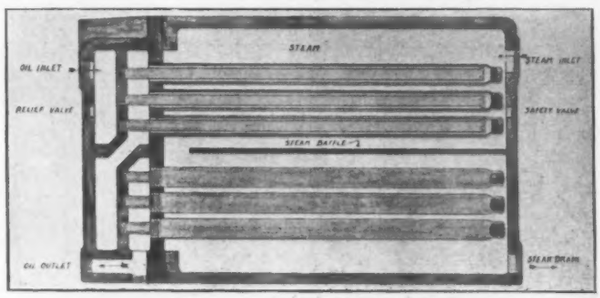
pressure in turn depends largely on the viscosity of the oil, so that viscosity has an important bearing on the heat transfer. The value of the coefficient, K, therefore varies between wide limits and for ordinary conditions may be said to lie between 15 and 50 B.t.u. per hour per square foot per degree difference in temperature.

For a heater in which the oil flows through the tubes it is a simple matter to divide the flow into passes so as to obtain the required velocity, the oil passing through first one group of tubes and then another. If the heater is designed to contain the oil in a shell outside the tubes, there is a tendency for the oil to short circuit across from the inlet to the outlet, leaving portions of the heating surface surrounded by dead or stagnant oil. To overcome this it is necessary to place baffles in the shell causing the oil to travel back and forth, and producing what is known as turbulent flow. If the baffles are properly designed, and the oil flow is sufficiently agitated it is possible to obtain as good heat transfer for a given drop in pressure by this means as by passing the oil through the tubes.

While oil heaters usually consist of a shell containing a series of tubes or coils, there are on the market a few special designs. One of these is the Coen multiunit oil heater, which is illustrated in this article. This heater is similar in design to the ordinary ammonia condenser used in ice machines, and consists of a series of double pipes, one inside the other, connected together by standard ammonia fittings. This heater may be constructed in any length or number of legs as desired. The oil passes through the inside pipe, and the steam is in the annular space between the two pipes.

Another heater of unusual design is the Schutte and Koerting fuel oil heater, shown in an accompanying illustration. This heater consists of a pair of spiral corrugated tubes, one inside the other, and both inclosed in a shell. The oil enters at E O and passes up the thin annular space, leaving at D O. The steam enters at E S, and is carried both inside the inner tube and outside the outer tube. For cleaning, the inner tube may be removed, or steam blown through the plugged openings F F.

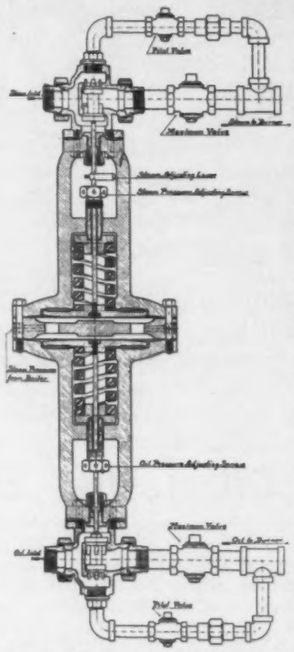
Oil Burners.—After leaving the heater the oil is led through piping and suitable regulating valves to the oil burners or atomizers, where it comes in contact with the atomizing agent and is delivered to the furnace in the form of a fine spray.



Nelson multi-pass film type porcupine oil heater, sectional view. This is a multi-pass heater using the principle of "porcupine" tubes, the tubes being free at one end for expansion and contraction.

Oil Piping.—Ordinary wrought iron or steel pipe is used for oil, the smaller sizes being screwed and the larger flanged. Gaskets of corrugated copper or compressed asbestos fibre are used. The size of pipe in most power plants is such as to give the oil a velocity of not more than 2 feet per second.

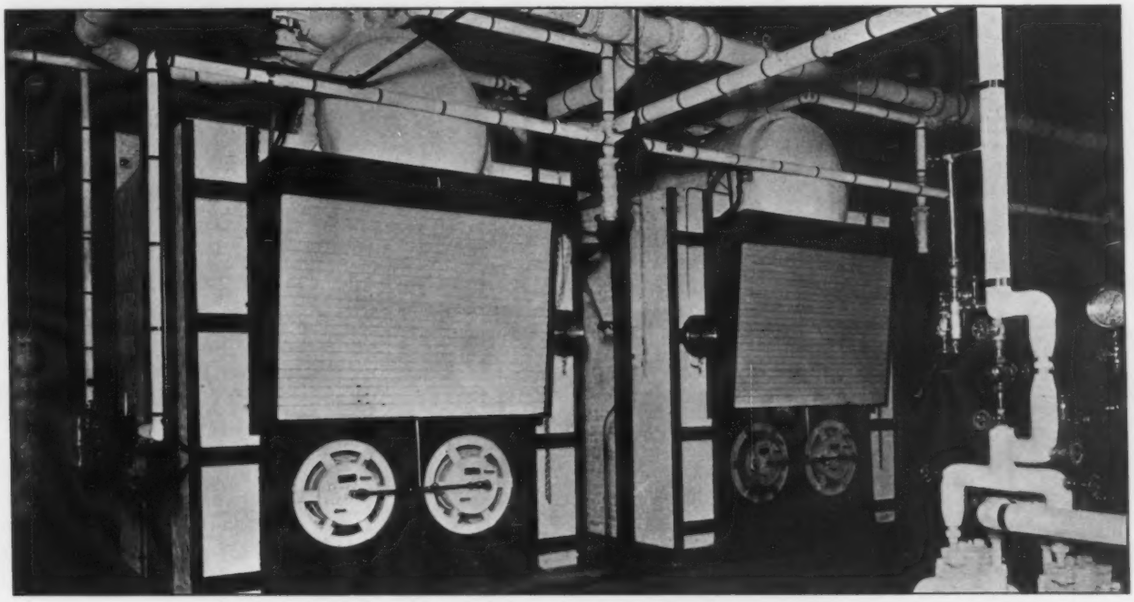
Automatic Regulators.—While in the majority of plants the oil is regulated by means of hand operated valves, automatic regulation has met with great success and is used quite extensively. The Witt Improved Oil Burner Governor consists of two independent diaphragm operated valves, controlled by springs, mounted so as to have the boiler steam pressure between the two diaphragms. This governor regulates both the oil supply and the steam supply to the burners. It is provided with pilot valves which prevent the fire going out when the load is light, and with maximum valves which prevent the fires becoming larger than a predetermined point. The governor, therefore, regulates the oil and steam between these two extremes.



G. E. Witt Co.'s Improved Oil Burner Governor. A device for automatically controlling the flow of steam and oil to burners.

The Moore Automatic Fuel Oil Regulator regulates not only the oil and steam but also the air required for combustion, thus controlling the three essential elements for firing the boiler. This apparatus consists of three separate regulators, one for the oil, one for the atomizing steam, and one for the air. These regulators are made up on the principle of the well known Spencer damper regulator, and the set of three can be arranged by suitable piping and shafting to control the firing of a number of boilers, and in many cases of the whole plant. In the oil regulator the diaphragm is operated by the boiler steam pressure, and the power lever is used to control a regulating valve in the main oil pipe supplying the burners. By this means a slight change in the boiler pressure is made to cause considerable change in the oil pressure, and as the quantity of oil supplied to the burners varies with the oil pressure, the fires in all boilers are increased or diminished gradually and simultaneously. This variable oil pressure is then made to act on the diaphragms of the other two regulators.

In the atomizing steam regulator, there are two diphragms, one acted on by the controlling oil pressure and the other connected to the atomizing steam pressure near the burners. These diaphragms are connected by levers which, acting through the water motor and connecting rod, operate a chronometer



TWO 250-HP. HEINE BOILERS WITH MECHANICAL BURNERS

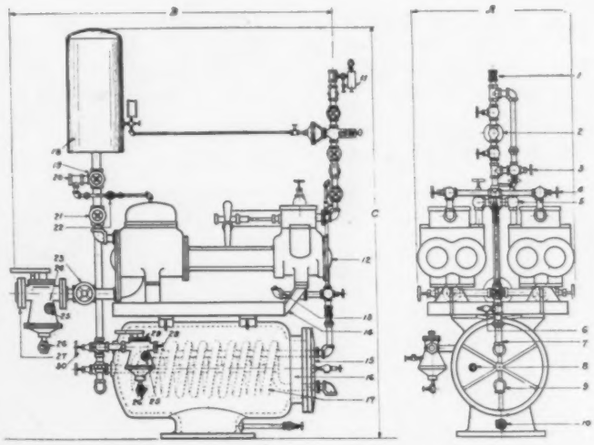
Standard equipment at eleven pumping stations—Shell Company of California Oil Pipe Line—installed by Sanderson & Porter. Duplicate duplex oil pumps in lower right hand corner are controlled by pump governor in steam supply line to produce constant oil pressure in receiver. Pump governor in oil discharge line from pump may also be seen just below oil gage and controls oil discharge to produce constant steam pressure because pressure side of its diaphragm is connected to steam line. Oil line from pump crosses overhead and descends to oil heater located on side of boiler setting in lower left hand corner, thence oil pipe runs direct to burners. Oil heater is supplied from auxiliary steam main through pump governor set maintaining constant pressure and hence constant temperature. Operation is entirely automatic, oil being supplied to the burners under control of the pump governors so as to maintain constant pressure.

valve in the atomizing steam main. Thus any increase in oil pressure causes a definite fixed increase in atomizing steam pressure. The steam pressure required has been found by experiment to be a multiple of the oil pressure plus a fixed pressure. This relationship is maintained by the regulator, the proportion being varied by the adjustable fulcrum and weights to suit the requirements of the type of burner employed.

The air is controlled by the third regulator which operates a rocker shaft connected to the dampers of all boilers. In this regulator the motion caused by the diaphragm, which is acted on by the oil pressure, is resisted by a coil spring. The amount of movement of the lever is therefore proportional to the oil pressure. This movement is communicated by means of a controlling valve and differential lever to a hydraulic cylinder, which in turn operates the rocker shaft connected to the dampers.

The Merit Automatic Oil Stoking System operates on the principle of controlling the fires in a series of steps, the fire jumping from a small fire to an intermediate fire and then to the maximum fire. The oil, atomizing steam and air are all three controlled by this regulator. The boiler steam pressure acts on the diaphragms of the master controller set, which consists of two parts, one for the maximum fire and one for the medium fire.

Each of these is piped to a damper operating device, and to a regulating device on each burner, which operates both the steam and the oil valve to the burner. For convenience fuel oil from the main oil supply pipe is used as the operating fluid, returning to the oil pump suction when used. If the boilers have full steam pressure up they will be working on the small fire. If the steam pressure begins to drop the first master controller diaphragm comes into play, opening the dampers to their medium position, and opening the intermediate oil and steam valves to each burner. These valves are always either open or shut, the amount of opening being fixed by adjustable auxiliary valves. If the steam pressure contin-



Staples and Pfeiffer oil pump and heater unit

ues to drop, the second master controller comes into play opening the damper to its full open position, and opening the remaining oil and steam valves to each burner, thus placing the maximum fire in operation. This condition will continue until the steam pressure rises sufficiently to shut off the maximum fire, when the boilers will return to the intermediate fire, and the operation will be repeated.

Steam Turbine Characteristics

BY WILLIS T. BATCHELLER

(This interesting series on the theory of the various types of steam turbines was temporarily discontinued after April first on account of the press of material in the convention issues. Following is the fourth article of the group. The author is electrical engineer with the Seattle Lighting Department, and is exceptionally well qualified to present the subject.—The Editor.)

THE REACTION TURBINE

In the reaction turbine the steam passes through a set of stationary guide vanes which direct the steam against the rotating blades. The drop in pressure is practically uniform through the stationary and rotating blades. Steam expands in the first row of stationary blades and accelerates the jet to practically the velocity of the moving blades. The steam enters the adjacent row of rotating blades with only a small impulse, and expands through this row, producing rotation by the reaction of the steam on the blades. The distinctive feature about the reaction turbine is that the drop of pressure and corresponding increase in velocity occurs in the rotating element.

Theoretically the area of the steam cylinder passages between the spindle and the cylinder should gradually increase from the high pressure to the low pressure end, but in practice the stages are made in three subdivisions and the length of blades in each stage is increased to take care of the increased volume of the steam. In the single flow reaction turbine, the end thrust, due to the difference in steam pressures at each end of the drum, is equalized by means of balancing pistons mounted on the rotor near the high pressure blading. Some turbines are constructed with the steam entering at the center of the rotor and flowing both ways to equalize the thrust. Provision for carrying overload is made by providing an auxiliary by-pass valve which admits high pressure steam to the intermediate stage of the turbine, resulting in slightly poorer economy. The Parsons reaction turbine is the best known type, and is manufactured by the Allis-Chalmers Manufacturing Company and by the Westinghouse Electric & Manufacturing Company.

Reaction Turbine Theory

A reaction turbine operating under the steam conditions specified for the nine stage impulse machine would have about forty-seven stages. With the same total heat drop of 380.5 B.t.u., the heat drop per stage is $\frac{380.5}{47} = 8.1$ B.t.u. per pound of steam.

The velocity of the steam entering the first set of stationary blades is assumed to be zero and the velocity imparted to the steam is

$$V_1 = 224 \sqrt{\frac{8.1}{2}}$$

$$= 451 \text{ ft. per sec.}$$

Since the entrance velocity is zero this also represents the spouting velocity.

With a peripheral velocity of 300 feet per second, and an exit angle of 50 degrees, the relative velocity of V_1 of the steam entering the moving blades is found to be 242 ft. per sec. The energy given up by expansion in the moving blades is

$$E = 778 \times \frac{8.1}{2} = 3151 \text{ ft. pounds per second.}$$

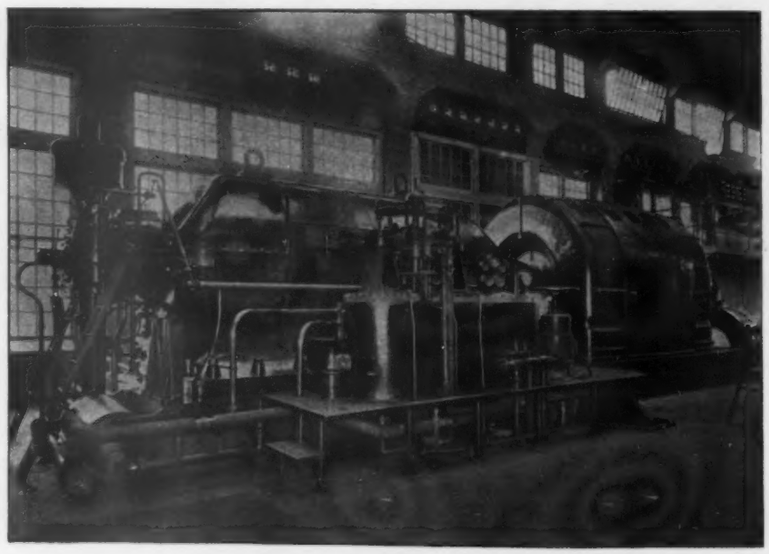
This energy is imparted to the steam in the first set of moving blades, where

$$E_2 = \frac{V_2^2 - V_1^2}{2g}$$

$$3151 = \frac{V_2^2 - 242^2}{64.4}$$

$$V_2^2 = 144{,}360$$

$$V_2 = 380 \text{ ft. per sec.}$$



10,000-kw. Westinghouse reaction turbine at the steam plant of the Great Western Power Company at Beach and Mason streets, San Francisco. This is one of the large modern installations on the Pacific Coast.

The resultant of V_2, the relative velocity of the steam leaving the moving blades and U, the peripheral velocity of the wheel, is 192 feet per second, V_3.

The energy converted into work in the first stage is

$$E = (V_1^2 + V_2^2 - v_1^2 - v_2^2)\ \frac{1}{64.4}$$

$$= (451^2 + 380^2 - 242^2 - 192^2)\ \frac{1}{64.4}$$

$$= \frac{252{,}373}{64.4}$$

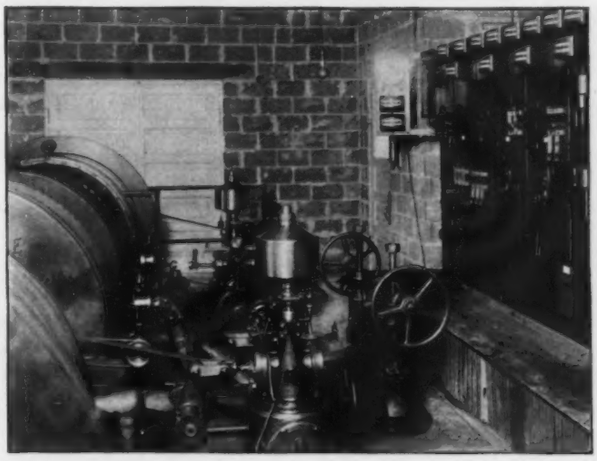
= 3920 foot-pounds per second or about seven horsepower for each pound of steam flowing through the ideal turbine.

Combined Impulse and Reaction Turbine

In the combined impulse and reaction turbine the smallest barrel of reaction blading is replaced by an impulse wheel. Steam enters through the nozzles and is discharged against a portion of the periphery of the impulse wheel. After leaving this wheel the steam enters the reaction blading through which it passes in the same manner as in a pure reaction machine. The advantage of this arrangement is that the high pressure, high temperature steam is confined to the nozzle chamber of the impulse element. The Westinghouse Company uses this design in the larger sizes of turbines.

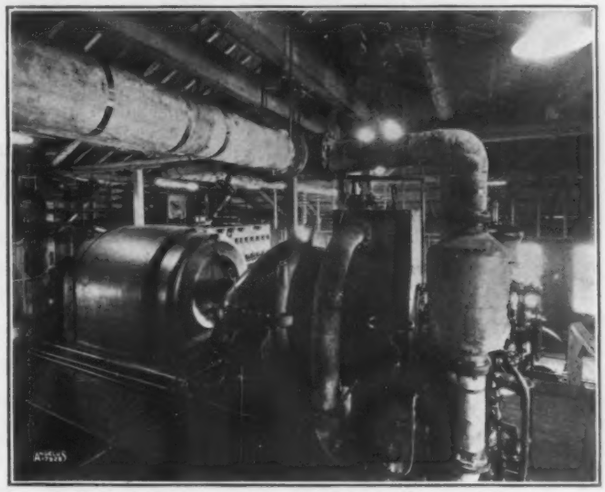
Compound Steam Turbines

In the high pressure stages of a Parsons turbine where the steam density is high, the steam area is relatively small, resulting in a small diameter rotor which must operate at high speed in order to have the best velocity ratio conducive to high economy. On the other hand, the rotative speed of the turbine is limited by the centrifugal stresses which



1875-kva., 80 per cent power factor, 480 volts, 3-phase, 60 cycles, 3600-r.p.m. with 15-kw. direct connected exciter. Geared turbine drives discharge pump of low level jet condenser.

occur at the exhaust end of the rotor where the blade area is largest to provide for the large volume of steam at exhaust pressure. In order to have both high and low pressure stages of large turbines operate at highest economy, the Westinghouse Company builds the multi-cylinder type, with the high pressure cylinder operating at about twice the speed of the low pressure cylinder. In this way the centrifugal stresses in the low pressure cylinder are kept within a safe working limit. Two-cylinder turbines are arranged tandem or cross compound. Three-cylinder cross compound units have a high pressure element consisting of a single cylinder, single-flow reaction turbine and two low pressure



1500-kw. Westinghouse Parsons reaction turbine of latest design, in power house of Crossett Western Lumber Company at Wauna, Oregon.

elements consisting of turbines of the double-flow type.

Multi-cylinder construction has the advantage over a single cylinder machine of the same capacity, having smaller cylinders, lower temperature range per cylinder, highest efficiency for each cylinder for the range of expansion involved, and reduced weight of parts to be handled. In case of emergency, any of the cylinders can be operated alone.

SOUTH AMERICAN RAILWAY ELECTRIFICATION

The Paulista Railway electrification in Brazil is one of the largest electrical projects now being pushed on that continent. This electrification will have an initial installation of 28 miles of track, but later extensions are to be made which will make a total of over 100 miles additional. The International Westinghouse Company has recently contracted to furnish four locomotives, two each for passenger and freight service.

The passenger locomotives have a one hour rating of 2000 hp. and weigh 121 tons. They will be operated from a 3000-volt, d.c. overhead trolley system and will be complete with regenerative control. They are designed for a maximum speed of 65 miles per hour and have a track gauge of 5 ft. 3 in. The freight locomotives have a one hour rating of 1500 hp. and will weigh 87 tons. They are also operated from a 3000-volt, d.c. overhead trolley system and will be complete with regenerative control. Their maximum speed will be 40 miles per hour.

In the regenerative braking system great care has been exercised so to perfect the design that there will be no likelihood of accidents due to the trains getting out of control on steep down grades.

The great fertility of this region in Idaho is largely dependent upon electricity, which by facilitating irrigation and other agricultural operations has contributed immeasurably to the development and prosperity of the district.

Developing Idaho by Water Power

(The more intimate knowledge all those of any one particular industry have of the parts more remote, the better fitted they are to carry on their own work. The following article, which describes in an interesting way the system of the Idaho Power Company, shows the progress in that fertile section of the West. This company has sufficient hydroelectric power to meet all needs for industrial and agricultural power for years to come.—The Editor.)

Operating throughout an extensive territory in southern and central Idaho, and in a section of eastern Oregon, the Idaho Power Company is not only playing an important part in the development of this rich and growing section of the country, but is itself, because of its strategic location both as to source of power and to a growing market, undergoing an unusual growth.

Electrical Development of Natural Resources

The Snake River district, which is served with electric power and light by this company, is an extensive, prosperous and steadily growing territory, rich in agricultural, mining and timber resources, and comprises the most populous part of Idaho. More than sixty communities are supplied with electric service by this company, including Boise, the state capital, Pocatello, the second largest city, and twelve county seats. The total population served is estimated at 150,000, based on the more than 30,000 names on the company's books.

In addition to furnishing current for lighting and miscellaneous uses in these communities, the company has important contracts for the sale of large amounts of power. Land development by the means of irrigation projects is one of the most important undertakings in the territory, so that the Idaho Power Company is called upon to furnish power for pumping water for irrigation purposes, in large and steadily increasing amounts. During the season of 1919, it supplied this essential service for the irrigation of 88,659 acres of land. In addition, it furnished power for the principal mining districts in the territory in which it operates, including Silver City, Mormon Basin, Corucopia, and Homestead.

Hydroelectric Developments

The Snake River with its tributaries is the source of power utilized by the company's twelve generating plants, for the river falls nearly 2500 feet in its 400 miles of winding course between the upper and lower plants. Advantage has been taken of this fall for the construction of seven hydroelectric developments at various points on the river, extending from southeastern Idaho to eastern Oregon. The eighth is at Thousand Springs, the waters of which flow into the Snake River. Two additional plants are located on the Malad and Payette rivers, both of which are tributaries of the Snake. The company also operates, under leases, two other hydroelectric plants. One of these, the property of the Boise Irrigation Project, was installed by the Federal Reclamation Service in connection with the construction of Arrowrock Dam.

The plants owned by the company have an aggregate installed generating capacity of 33,540 kw. and those leased an aggregate of 2,775 kw., making a total capacity of 36,315 kw. operated. An additional capacity of 6,000 kw. has been added to the plant at Thousand Springs, in order to be available for use during the summer of 1920. The immense supply of water power not yet developed still leaves room for almost unlimited growth, and makes it quite certain that the company will never have to depend on coal supply to keep up with its growing market for power.

Interconnected Plants

All of the generating plants, excepting the American Falls plants operated by the company, are interconnected by a comprehensive system of transmission lines and are operated in one group. This interconnected system supplies all the electric power and light of the company except that used in the territory in and about Pocatello, American Falls and Blackfoot.

The plants supplying this vicinity are connected with the transmission system of the Utah Power & Light Company; so that every point covered by the operations of the Idaho organization is practically guaranteed continuous service, no matter what happens. As conditions justify, the two groups will be connected and the entire property will be operated as a single system. The company's transmission lines aggregate 1,139 miles, including the line to the Jarbridge mining section, which supplies the Nevada Power Company.

Mill of the Homestead Iron Dykes Mining Company electrically operated with power supplied through the Idaho Power Company

Street Railways

A street railway system in Boise, and an interurban railway connecting Boise with Nampa, Caldwell, Middleton and other towns are owned and operated by the Boise Valley Traction Company, a subsidiary organization. Its interurban lines total seventy miles of single track equivalent, while the city lines total approximately 13 miles. Electrical power for the operation of these lines is purchased from the Idaho Power Company. The Nevada Power Company supplies electricity to the Jarbridge mining section in northern Nevada. The electric sub-station of the Nevada company is supplied by a 66,000-volt transmission line, 71 miles in length, from the system of the Idaho Power Company.

Since the company was incorporated in 1915, its growth has been phenomenal, while its prospects for rapid and steady development in the future are more than assured. The immense and fertile territory covered by its operations is just in the period of greatest development. Every year the acreage under agricultural cultivation is greatly increased, old manufacturing and industrial plants are growing, while new ones are constantly springing up. The population is mounting by leaps and bounds. All these things, together with the assurance of almost unlimited water power, promise a great future for this Idaho company.

The Man in the Company

BY A. B. WOLLABER

(The broader relation of the employe to his work and to his company has a very definite influence, not only upon his own immediate advancement but upon his ultimate development as a worker. Some of the aspects of the work of various employes in a public utility company are taken up in the following article. The author is district manager with the Southern California Edison Company.—The Editor.)

It is sometimes remarked that few if any of the chief clerks in this or that company ever become local managers, and it has often occurred to me that the chief clerk is, or at least should be, the one best qualified to fill the responsible position of local representative.

The Chief Clerk

Of chief clerks I would ask the question, what are you doing to qualify yourself for the position higher up? What is there in your work that marks you as a safe man—one that the management can look to as a corner stone for the district organization? Are you making the most of every opportunity to learn more about the business in which you are engaged by good, hard, conscientious study? Do you take an interest in and carefully read the many splendid articles which come to you through the excellent publications so generously furnished by the company? What have you done to inform yourself of the relation your company bears to the community in which you are doing business, and what its relation is to the various city officials? Are you thoroughly posted on your company's policies so far as they concern your individual district, its methods of financing and rate making, and are you capable of conversing intelligently on these subjects? Are you familiarizing yourself with what other utility companies are accomplishing in the business world? Are you making the best of every opportunity given you to show your fitness for a higher position by doing your work just a little bit better than that particular job was ever done before? It is well occasionally to pin yourself up on the wall, so to speak, and look yourself over and then ask this question, "What have I done to merit consideration for work of a higher intellectual character with my company?" Upon your answer to this question, if made without self-pity, egotism or malice, will depend your success in any organization with which you are identified. Remember this, you will take out of your work just what you put into it.

The District Foreman

Outside of the district office there is no more important position than that of the district foreman. Upon him depends the continuity of service, and it largely rests with him as to what impression the community gets of your service. His forces are constantly in touch with the public, and the question

to be asked is, are these impressions always the best? Are you careful with your work and are you as quick to commend those under you for good work as you are to condemn them for poor? Are you doing everything in your power to advance your forces to higher positions with the company, and are you big and broad enough to recommend for a foreman's position one of your assistants, even though you may find it difficult to fill his place? Are you in the habit of taking your men into your confidence and explaining to them in a general way the conditions under which the company is operating in your particular district, with a view toward encouraging them to better efforts and more economical operation? Are you careful to see that the equipment furnished your forces is the best, and up to the standard desired by the company? Are you careful to see that those under you are provided with literature pertaining to the electrical industry? Are you careful at all times to make your work and the surroundings of your fellow workers the pleasantest possible in order that they may be loyal, satisfied and efficient employes of the company? Briefly, these are a few of the things that the district foreman can do towards securing better service, and a better profit to those working under him. The result will be a gain for your company as well as yourself, and an incentive for those willing workers in the ranks who are always ready to keep the old ship moving in order that the impressions of the public may be the very best.

Other Employes

In the last class we have placed the other district employes, and our remarks to these must be more or less general but applicable to all. The counterman, meter readers and collectors are the ones who also come in contact with the consumer, and to them a great opportunity is given to learn, because a thorough knowledge of human nature is a great asset in the administration of any business. I am going to ask the employes in this class what they are doing to merit advancement to higher positions. Are you ever alert to safeguard your company and the official under whom you are working from dangerous conditions? It may be only a slight remark dropped at the counter, to the meter man or to a collector, but this remark ofttimes furnishes a clue to a situation that might prove disastrous to your company. If you adopt an "I should worry" attitude, where will your profit come from? It may be that your failure to watch and listen and then report to your superiors, is the very thing that will contribute to the loss of business, or to the establishment of another company in your community. Are you familiar with the rates your company charges for its commodity, and are you capable of quoting these rates and discussing them with the company's consumers? How often we hear the man at the counter say, when asked regarding power or rates, "I will take your order and our salesman will call on you." The rates of the company are not complicated and they are open to the inspection of all. Those inside the office are quite as capable of analyzing them as are the regular employes assigned to that kind of work. By taking an interest in such matters you gain in knowledge and enhance your value to your company and to the community you serve; then when the time comes to fill one of the higher positions you are well equipped for the job, and you have gained the profit.

Consistent Ambition

Each and every employe in the company, bookkeepers, meter readers, collectors, on-and-off men, and so forth, should be alert and anxious to take advantage of every detail which will increase their value to their company, by studying the job just ahead, by punctuality, application to duty, alertness, accuracy and above all, honesty. If you are satisfied with the position of bookkeeper, counterman or any of the other positions mentioned in this class, you are wasting your time. For without ambition to rise in any business, what incentive is there for good work? Do not be surprised if you fail to take from your work a just reward for such indifference, and find yourself rising no higher than the position you now occupy.

The following extract from a report recently issued by a special committee of the New York Merchants' Association on Government Ownership and Operation of Public Utilities is representative of what all large business concerns are striving for in their relation to their employes. It says:

"The success of any economic undertaking depends in very large degree upon the ability and skill, the zeal and energy, and the soundness of judgment of the human agents employed therein. Ability and skill in a particular field are the products of special and usually prolonged training; by far the most powerful motive of zeal and energy in the ordinary affairs of the world is self-interest as understood in its widest meaning; and intimate knowledge derived from experience is essential to sound judgment in business affairs. Every large business concern seeks to embody in its management and working organization intimate knowledge, long experience, sound judgment, special ability and skill, zeal and energy. Having secured these qualities it seeks to retain and expand them by making the self-interest and ambition of officials and employes a dominant motive for loyal devotion to the welfare of the business. The motive of self-interest and ambition is brought into play by the free opportunity of advancement always open to special ability and zeal, and by the assurance of permanent tenure to those who are efficient."

In closing let me say to all that the employes of any organization should never forget that they are competitors, not merely units in a great machine. Keep this thought ever before you and know that you will get a just reward for the labor you put forth.

SAFETY

Human life must be made safe. Property must be protected. Electrical methods invariably reduce hazards.

The application of electricity, with modern developments in insulation and safety appliances, will eliminate accidents and conserve property.

Ease of control is one of electricity's greatest advantages. Magnetic switches, relays and automatic devices of infinite variety reduce the operation of terrific forces to the simplicity of the push button.

Education to the merits of quality wiring and quality apparatus will maintain the high standards of industry.

California Precipitation

BY ANDREW H. PALMER

(The importance of the water supply in California makes precipitation figures for this region of more than usual interest. The following article, of which the first part appeared in the June 15th issue, reviews the snowfall in the mountain districts, with special emphasis on the headwaters of the important streams. The author is meteorologist with the U. S. Weather Bureau.—The Editor.)

The Weather Bureau maintains a considerable number of elevated stations in the Sierra Nevada Mountains where careful measurements of precipitation, especially snowfall, are made. The highest of these stations is 8,390 feet above sea level. The records are of various lengths, those at stations along the Overland Route of the Southern Pacific Railroad now covering 43 years. Data from these stations are of great value to engineers in estimating water for hydroelectric power and irrigation.

Snowfall in the Mountains

Snowfall data for a number of stations are summarized in Tables III and IV. The marked deficiency of snowfall during the present season, and particularly during January and February, is readily apparent. While considerable snow fell during March, a word of caution is appropriate in this connection. Under normal conditions abundant snow falls during the midwinter months, and it packs through pressure resulting from weight and also through alternate freezing and thawing. As snow falls it is ordinarily 10 per cent water, by volume. In other words, 10 inches of newly fallen snow is usually equivalent to one inch of rain. Moreover, during a normal season the snow comes in well distributed instalments, and in the spring it is densely packed in layers, some of which have the consistency of ice. Extensive measurements of the water content of snow on the ground made in spring snow surveys by Professor J. E. Church, Jr., of the University of Nevada, and by representatives of the Weather Bureau, have shown that packed snow lying on the ground averages about 40 per cent water, by volume. Since the snow of the present season has not packed to any considerable extent, the lately fallen snow is light, and contains less water than similar depths of former years. It will disappear rapidly, either through melting or as a result of dessicating, northerly winds. There is little of the packed snow which can be expected to furnish an ample water supply through slow melting in the coming summer. The light density of the snow on the ground should be borne in mind in examining the accompanying curves showing the depth of the snow on the ground at Summit.

Run-Off Data

Because of the fact that this is the fourth consecutive season with deficient precipitation in California, the cumulative effects of deficient precipitation are evident in the stages and discharges of streams. The rocks have retained relatively little moisture, ground water has receded to extremely low levels, and the soil has remained relatively dry. A peculiar phenomenon has made this condition impressive. The stage of the Sacramento River has been so low recently that the salt water of San Francisco Bay has encroached upon the lands of the delta region, seriously threatening the fertility of that vast territory. Irreparable harm and permanent damage may result if the threatened condition becomes acute.

In Table V are summarized discharge data of

Table III

SNOWFALL IN INCHES

Normals—upper figures
Season of 1919-20—lower figures

Station	County	Alt. (Feet)	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Season
Bishop Creek	Inyo	8390	..	8	10	28	52	38	27	12	10	1	186
			..	..	1	3	0	36	45	1	..	..	
Blue Canon	Placer	4695	..	3	9	29	54	46	54	12	4	..	211
			..	3	6	62	4	25	84	18	..	..	
Emigrant Gap	Placer	5230	..	8	13	39	54	60	54	39	11	..	278
			..	2	9	62	8	26	108	48	..	..	
Fordyce Dam	Nevada	6500	2	13	33	53	98	76	86	26	14	1	402
			2	15	19	107	11	44	102	51	..	..	
Inskip	Butte	4975	..	2	7	41	78	50	48	10	5	..	241
			..	1	7	49	4	39	86	20	..	..	
Lake Eleanor	Tuolumne	4700	..	1	8	24	51	28	36	9	1	..	158
			..	..	2	40	1	22	71	12	..	..	
Lake Spaulding	Nevada	4600	..	4	10	54	58	46	67	13	3	..	255
			..	3	8	48	7	20	82	34	..	..	
La Porte	Plumas	5000	..	6	15	37	63	51	61	29	10	1	273
			..	2	8	60	2	32	70	..	..	..	
McCloud	Siskiyou	3270	..	..	4	29	62	13	16	2	..	..	126
			..	..	3	33	0	4	6	12	..	..	
Quincy	Plumas	3400	..	1	3	10	29	13	20	1	..	..	77
			..	..	5	38	0	7	26	2	..	..	
Sierraville	Sierra	5000	..	..	4	18	50	20	14	1	..	..	107
			..	..	4	40	4	6	32	19	..	..	
Sisson	Siskiyou	3555	..	..	4	24	37	20	22	5	..	..	112
			..	..	2	35	1	10	18	5	..	..	
Squirrel Inn	San Bernardino	5280	..	..	2	11	9	16	11	8	2	..	59
			..	..	8	5	0	4	29	3	..	..	
Summit	Placer	7017	2	18	34	72	79	76	47	56	20	2	406
			..	10	18	65	20	40	111	62	..	..	
Tamarack	Alpine	8000	3	14	53	95	187	77	96	26	29	7	587
			4	11	30	84	24	60	96	47	..	..	
Yosemite	Mariposa	3960	..	..	4	17	39	21	20	4	..	..	105
			..	..	0	36	0	18	40	6	..	..	

Table IV

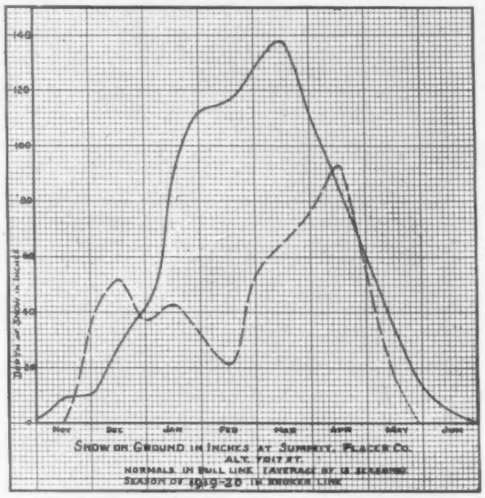
SNOW ON GROUND IN INCHES

Normals—upper figures
Season of 1919-20—lower figures

Date	Fordyce Dam Nevada Co. Alt. 6500 Ft.	Summit Placer Co. Alt. 7017 Ft.	Tamarack Alpine Co. Alt. 8000 Ft.
November 1	1	1	1
	0	0	0
November 15	8	9	11
	0	0	0
December 1	9	10	17
	18	34	36
December 15	28	28	38
	50	52	48
January 1	38	41	57
	34	37	28
January 15	71	87	101
	33	43	28
February 1	83	112	139
	34	32	21
February 15	92	116	149
	30	21	27
March 1	112	128	173
	54	53	60
March 15	109	138	177
	58	65	56
April 1	103	114	167
	67	76	86
April 15	87	87	135
	74	93	90
May 1	68	60	115
	50	55	72
May 15	50	34	95
		16	
May 31	29	14	65

some of the principal California streams. These data have been kindly furnished by the Water Resources Branch of the U. S. Geological Survey.

The present rainy season has brought deficient precipitation to all the Pacific Coast states. The months of December, January and February were relatively dry in the states of Nevada, Oregon and Washington, as well as in California. In Oregon,



Mass curves of precipitation for the state of California based on averages from about 300 stations. The heavy line represents the normal, and the dotted line the precipitation for the season 1919-1920.

January and February, 1920, were the driest months of those names in 30 years of record.

A peculiar feature of the weather during the present season is the fact that there has been an apparent northward migration of the usual conditions affecting the weather of the Pacific Coast. Storms entering the continent of North America from the Pacific Ocean have taken northern routes, so far to the north that California has been outside of the range of precipitation for most of them. Moreover, extreme southern California has had relatively heavy precipitation from storms of the sonora type. The rainfall has been sufficiently heavy in Arizona and in New Mexico to cause floods.

The question is often asked, "Is the climate changing?" The idea is expressed in various ways. Some say that the removal of the forests and the increasing cultivation of the interior valleys have affected the climate of California. Others say that the great earthquake of 1906 changed the course of the Japan Current. However, there is no evidence in the longer records, some of which now cover 70 years, that the climate is changing or has changed recently. There is no progressive change indicated. To the question the Weather Bureau therefore answers emphatically, "No, the climate is not changing."

All available data point to the inevitable conclusion that northern and central California face a serious shortage of water during the summer of 1920. The utmost conservation of water is urged. Timely warnings have already been given to the agricultural interests to plant only such crops as will

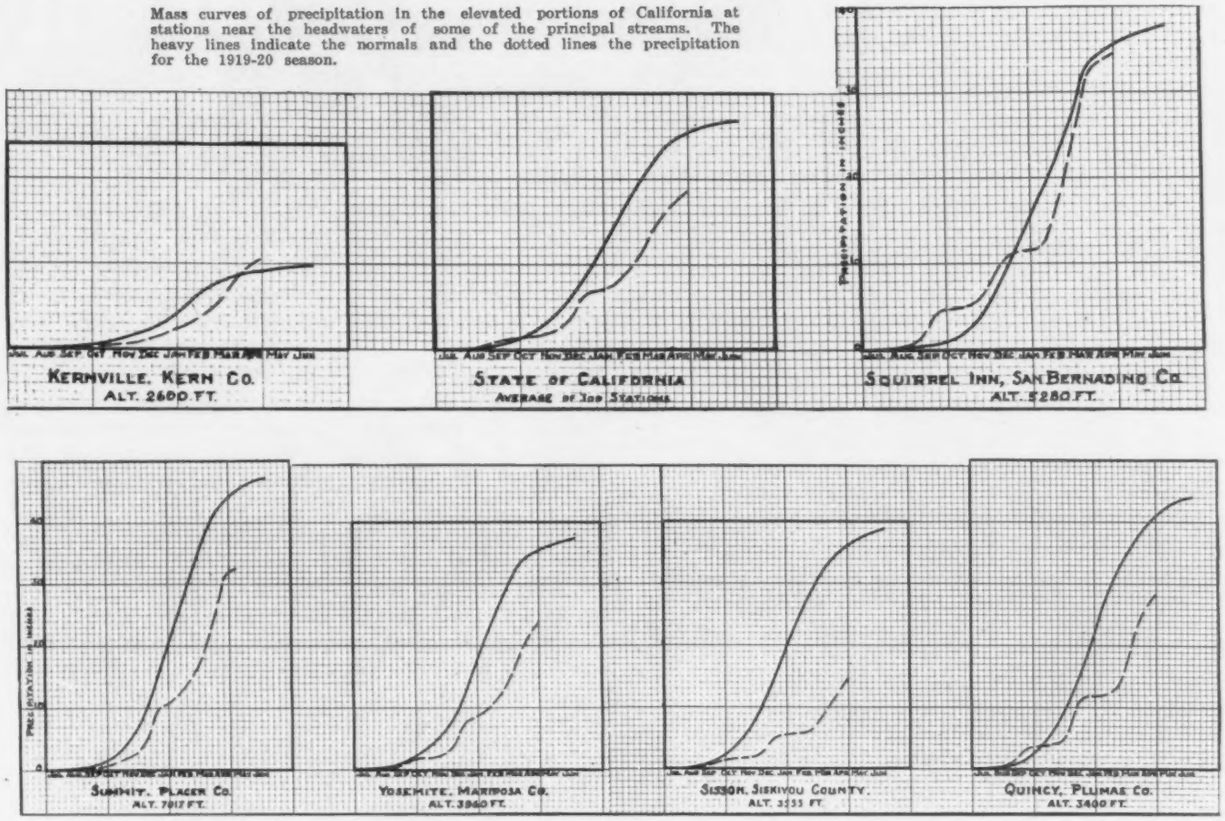
TABLE V

	Period of Record	Mean Discharge in Second-Feet												Discharge in Second-Feet Oct., 1919 March, 1920		Total Run-off in Acre-Feet Oct.—March		% 1919-20 of Normal
		October		November		December		January		February		March						
		1919	Normal	1919	Normal	1919	Normal	1920	Normal	1920	Normal	1920	Normal	Max.	Min.	1919-20	Normal	
SACRAMENTO BASIN																		
Sacramento River, at Red Bluff	1895–1920	4,460	5,540	4,260	6,260	5,760	10,900	4,910	21,900	4,780	27,700	8,380	26,700	17,800	4,010	1,950,000	5,990,000	33
Pit River, at Ydalpom	1910–1920	2,570	2,870	2,510	3,170	3,380	3,580	2,690	6,000	2,680	7,940	3,930	8,190	7,120	2,510	1,076,000	1,833,000	58
McCloud River, at Baird	1910–1920	982	1,240	952	1,360	1,080	1,600	970	2,670	929	3,700	1,280	3,120	2,230	910	374,700	822,000	45
Feather River, at Oroville	1902–1920	2,010	1,880	1,810	3,380	2,340	4,090	1,730	8,870	1,800	11,600	4,130	15,200	8,800	902	840,000	2,724,000	31
Yuba River, at Smartsville	1903–1920	288	508	276	1,140	1,100	1,800	604	4,930	844	5,890	2,830	7,020	7,040	183	361,000	1,288,000	28
Bear River, at Van Trent	1904–1920	17	66	18	116	136	412	54	1,470	62	1,430	.....	1,290	*1,200	* 9	*17,400	*200,000	* 8
American River, at Fairoaks	1904–1920	159	372	151	805	688	1,620	632	6,020	652	6,470	3,970	8,170	10,800	112	381,000	1,419,000	27
Cache Creek, at Yolo	1902–1920	0	24	0	56	0	270	0	1,740	0	2,480	.....	2,190	.....	0	0	*275,000	* 0
Putah Creek, at Winters	1905–1920	0	6	0	36	25	507	17	2,760	13	2,140	.....	1,520	*80	0	* 3,310	329,000	* 1
SAN JOAQUIN BASIN																		
Tule River, at Porterville	1901–1920	9	27	16	38	52	92	31	255	38	223	.....	358	* 393	* 6	*8,820	* 38,400	*23
Kaweah River, at Three Rivers	1903–1920	63	116	61	93	474	178	117	492	167	496	.....	819	*2,420	* 28	*53,400	* 82,900	*64
Kings River, at Sanger	1895–1920	230	476	197	446	426	516	322	1,390	423	1,320	1,690	2,230	3,180	160	200,100	446,000	45
San Joaquin River, at Newman	1912–1920	88	116	112	342	366	615	353	2,640	307	4,570	.....	5,600	* 680	* 80	*74,000	*494,000	*15
Merced River, at Exchequer	1901–1920	55	252	60	219	189	368	160	1,210	224	1,280	1,310	1,600	5,100	* 45	122,400	298,800	41
Stanislaus River, at Knight's Ferry	1905–1920	129	256	78	367	209	507	170	1,440	232	2,930	.....	2,760	*705	* 45	49,300	261,000	19
Mokelumne River, at Clements	1907–1920	76	142	88	235	192	352	127	961	143	1,160	708	1,700	2,550	33	81,300	281,000	29
Coeumnes River, at Michigan Bar	1907–1920	11	22	13	65	127	224	73	134	74	1,300	.....	1,350	*635	* 6	* 18,000	*105,000	*17
Tuolumne River, at La Grange	1895–1920	110	413	50	662	298	828	318	2,070	417	2,550	2,350	3,790	9,060	27	216,000	624,000	35
San Joaquin River, at Friant	1907–1920	364	574	313	470	489	745	438	1,770	503	1,690	.....	2,600	*2,160	*246	*127,000	*312,000	*41

*Includes data to end of February only.

Discharge data of some of the principal California streams.

Mass curves of precipitation in the elevated portions of California at stations near the headwaters of some of the principal streams. The heavy lines indicate the normals and the dotted lines the precipitation for the 1919-20 season.



require a minimum amount of irrigation water. The rice acreage has been reduced as a result.

Because of the authority it exercises over public utilities, the Railroad Commission of the State of California organized an Emergency Water Conservation Conference in order to deal effectively and efficiently with problems arising from the threatened water shortage. This Conference includes representatives of all the state and federal agencies concerned with the water problem. Precautionary advices have already been issued by the Conference. Most of the large irrigation interests of the Sacramento Valley have signed an agreement which authorizes this Conference to control and regulate all water available in that region. This step was taken in order that litigation might be avoided, and that efficient and just distribution of the available water might be secured. Mr. H. G. Butler, Power Administrator of the Railroad Commission, is authority for the statement that the financial loss to the Sacramento Valley during the coming summer will be about $22,000,000 as a result of the deficient precipitation of the wet season now presumably closed.

Previous to March 1 the precipitation had been so light that the agricultural interests of California appeared to face disaster. The generous rains of March relieved the situation somewhat, and assured the maturing of winter growing grains and grasses. Fruit trees were revived and pastures and ranges improved. But the previous deficit was so great that the March rains, though worth millions of dollars to the state, offered only temporary relief. It is now reasonably certain that there will be a serious shortage of water during the summer of 1920 throughout northern and central California. With a seasonal precipitation in these portions of the state less than half of the normal, the water shortage this summer is certain to be acute. Hydroelectric power and irrigation interests are advised to make plans accordingly. The utmost conservation of water is urged upon all until the next rainy season again replenishes the depleted reservoirs.

ANALYSIS OF ACCIDENTS

On the companies' premises, "handling material" comes first. Accidents from electric current—from shock, burns, eye-flash—rank fourth in a list of eighteen classes of accidents. Only .7 per cent were due to exhaustion from heat.

From a general consideration, injuries to fingers were highest, eyes next, and ears last in a classification of thirty-five anatomical locations. From the standpoint of occupation, linemen ranked first and carpenters lowest.

Of all the accidents reported, 25.9 per cent, or the highest single percentage, had all been in the employ of the companies less than six months. Those veterans of over twenty years' service contributed only 1.1 per cent to the casualty list.

While only 8.3 per cent were injured by electric current, these accidents were responsible for over 70 per cent of the total lost time, and 70 per cent of the serious and fatal accidents. The fact is, however—and it is encouraging—that 75 per cent of this class of accidents are preventable when the proper safety devices are installed.

Principles of a Profit-Making Appliance Business

BY T. W. SIMPSON

(The electrical appliance business, though perhaps fairly simple on the surface, involves a number of elements which play a vital part in the retailer's success or failure. The following article by the western district manager of the Federal Electric Company analyzes some of the main factors which make an appliance business profitable.—The Editor.)

It is possible in the electric appliance business to start with a shoestring and have ten thousand dollars in the bank in a year, but some men have that sum to start with and only the shoestring at the end of the year. Much emphasis has been laid on methods of salesmanship as a factor of success, but this is valueless without a strict adherence to the fundamental business principles that practice proves correct in this field.

Ability of the Owner or Manager

Does the manager or proprietor enjoy selling to women and the household? Is he wrapped up in the business? Would he rather demonstrate an appliance on the store floor or in the home than do anything else? Success in this field cannot come unless the responsible head enjoys and likes the work, and possesses the power and magnetism of personal salesmanship. That is why the sewing machine men, phonograph men and piano salesmen make better electrical appliance men than do contractors or others well versed in electricity. If it is repugnant to you to punch a door bell and say, "Good morning, madam," you should stay out of the electrical appliance field. You should really feel the inspiration that comes from soliciting in the interest of increasing household efficiency and relieving drudgery.

Departmentizing Sales and Contracting

If you are a contractor in any but the smallest towns it is necessary to divorce the appliance sales business from the contracting end, and put yourself or a competent manager in charge who will think appliances and nothing else. If a contractor cannot arrange to do this it is better for him to do very little with appliances, as it is too much to expect of a man that he be a good contractor and a good appliance man at the same time. Divided energies bring nowhere near the results of a concentrated effort in one field. This has been demonstrated in more businesses than in the electrical. Shoemakers cannot run shoe stores. Automobile service men cannot sell automobiles. When a hardware dealer opens up a sheet metal or tin shop his total earnings usually drop. The sales instinct and the operating instinct are diverse and there is no use in going against human nature by mixing sales work and contracting under the same hat.

Buying

Suppose it is decided to open an appliance business. What are the approved time-tested business methods to be followed? In choosing your line of goods emphasis should be laid on the profit per line per year rather than on the discount or profit on each article. The woods are full of long discount lines with no national advertising, no nearby jobbing stocks, no sales helps, and no workable plan to help finance instalment payments. On the larger items, such as cleaners and washers, it is vitally necessary that you choose lines where the manufacturer has some workable plan of assisting in caring for the instalment contracts. A separate section below relates in detail to this most important feature. It is desirable not to overbuy so that nothing will interfere with taking cash discounts. If you have a proper way of caring for instalment contracts you can always take cash discounts on the larger items of cleaners and washers. A concern that will not take cash discounts on washers and cleaners when there is available a workable plan to get cash on its instalment contracts is open to suspicion. The legitimate source of help in buying is your bank. It is usually wise to buy washers in car lots and place the car in the warehouse and borrow on the warehouse receipt to pay the concern from whom you bought the car lot. Banks like this class of business and will loan up to 80 or 90 per cent of the factory cost to dealers on standard, well-known makes of goods. They will not loan over half this percentage on unknown or unadvertised makes, or on goods made by irresponsible manufacturers. Some dealers have bought carloads on open account and warehoused them and borrowed on the warehouse receipt and used the proceeds for other uses than paying the creditor. This is a sure road to ruin.

Sales Methods as Affecting Profit

Assuming the goods to be on hand, the details of the sales methods should be worked out to guard the concern against wasting of assets and contingent liability. The proprietor or appliance manager should be the floor manager and should sell a large quantity of the goods from the floor. Other floor salesmen should be paid a salary and a small commission on all sales made over a monthly quota. Outside solicitors should be paid straight commission and receive only one-half their regular commission on sales made that require the aid of the manager or floor force. This will keep them at work trying to close sales, yet will make them willing to appeal to the manager or floor force when it appears to them the sale is getting away from them. Salesmen should receive a larger commission for cash sales than they they do for instalment sales. Salesmen's automobiles should be personally owned by the salesmen. If the concern wishes to help a salesman purchase an automobile, it should make the first payment for the salesman and insist that he pay the remaining installments. This places the responsibility with the salesman in case of accident, and involves the firm in no lawsuit arising from operation of the automobile.

Door-to-Door Solicitation

Some of the best electrical dealers believe that the day of door-to-door solicitation is passing, and

they place emphasis on the necessity of floor salesmanship, and the location of the store in recognized shopping centers with correspondingly high rentals. Possibly it may be true that outside solicitation is not absolutely necessary in all cases. It is certainly true that the demand for some electrical appliances is very strong at this time, so that many customers are looking for you as much as you are looking for them; but it would appear that the answer to this question might be found by examining the experience of kindred lines. The general agent of a large sewing machine company remarked to the writer that their sales would drop 80 per cent if it were not for house-to-house solicitation, that they had tried all possible sales plans, such as store displays, club offers, advertising, sewing schools, window demonstrations and the like, but that house-to-house solicitation was the one and only plan for continuous success. Musical instrument companies are large users of outside solicitors. The electrical appliance dealer cannot refuse to heed these signs.

This article does not treat on how to sell appliances, but the following useful hint from the experience of Mr. B. J. Holt of Woodland, California, an experienced solicitor, is given. Mr. Holt says:

"A woman may be the best possible prospect for your goods, yet she is plainly hostile to you as she opens the door. She will continue this hostility in spite of your sales talk and unless you quickly overcome it you have no chance to make a sale. To break down this wall of ill favor I have a regular plan. In my spare time I make a little device from wire that has for its object the fastening of the cloth on the household ironing board. These clips cost me half a cent each. I put a pair in a sealed envelope devoid of marking and present one to the woman as she opens the door, saying, 'I have called to distribute a little souvenir as an advertisement to the ladies of this neighborhood of our new electrical department.' She is taken aback, and seeing nothing printed on the envelope may ask what it is. Then I tear open the envelope and all she sees is a twisted piece of wire, so I get her permission to explain how it is used, and in nine cases out of ten I am invited inside to show her how it goes on her ironing board. The opening thus created makes her willing to listen to my canvass."

Conservation of the Inventory

Closely related to sales methods is the problem of demonstrations, free trials, etc. The electrical merchant who plans for success had better establish a definite rule at the start that all goods over $20 in value must be settled for on a lease contract before leaving the store and the initial payment made. Commission salesmen will have a thousand reasons why this rule is not a good one, but the wise merchant will positively insist upon it. If a customer wants a demonstration in the home, by all means give it to her, but have it made by the salesman's demonstrating machine and not by a new article. Teach the salesman to say, "Certainly, madam, you want to see the —— operate in your own home under your own conditions. I will be here with my demonstrating machine on Tuesday. Of course that is not the machine that you will get when you buy because we always deliver a brand new machine in the original crate to you so you will know it is exactly as it came from the factory and with the factory guarantee—all spic and span." This plan requires some one to come with the machine to uncrate it on the customer's premises, set it up, oil it, and instruct the customer; but it is the customer's machine upon which a deposit has been made, and the work of delivering can be done by the service man instead of by the salesman who took the order.

In the merchant's stock care should be taken to keep as much material as possible in the original shipping package. Don't let your vanity lead you to open it all up and make a big display. As soon as it is opened depreciation sets in. First decide what stock you need for the so-called "working inventory." This should comprise floor displays and a demonstrator for each outside salesman. The balance of the stock is "liquid inventory," worth 100 cents on the dollar exactly as it came from the factory and it should be kept in that condition unopened until sold.

Turning the used demonstrators is an art. Often they can be sold at no sacrifice, by playing upon the feeling of many customers that a demonstrating machine is something specially tuned up and that it may not look as well as a new machine but it has better stuff in it or is better adjusted. The manufacturer will supply paint and refinishing material to keep demonstrating machines looking well. Don't let salesmen override you in the plea that they must have a new demonstrator to help close a deal. Do not give the salesman a new demonstrator until the old one has been sold. Many firms find it advisable to charge their outside salesmen with one-half or all of the loss taken in selling their demonstrators.

Conservation of the inventory by keeping all possible goods in original packages is a fundamental principle of successful appliance merchandising. Customers like it better and are better satisfied. There is less money tied up for the dealer. It overcomes the tendency to overbuy.

Sell on Time Only to Those Who Must Buy on Time

This important principle will take care of itself if salesmen are given a larger commission for cash sales than for time sales. Money is so tight at present that concentration should be made on cash sales insofar as possible. Some customers are natural time buyers, such as the wife of the salaried man, but farmers and men with independent businesses should be sold for cash. The farmer has no set monthly income and should pay cash, or half cash and balance after the next crop comes in. One way to do with the salaried class is to take the order on term payments and then let the collection department offer as big discount for cash as was the premium for selling on time.

Financing Term Payment Accounts

Bank examiners hold that lease contracts or instalment paper is a poor security for a bank loan and technically regard loans secured by such collateral as "unsecured." This explains why dealers obtain so little help from banks in caring for term payments. Trust companies and private capitalists take advantage of this situation by various plans to help the dealer carry the term payments. The usual plan is for the dealer to deliver say $5,000 worth of lease contracts as collateral for a note signed by the dealer of an amount ranging from $2,500 to

$4,000, depending upon how much excess security the note holder demands. The dealer is then permitted to collect the accounts and make monthly remittances on his own note. Many dealers do not recognize the great amount of their capital that is absorbed by these excesses or overages of the security delivered to the financial agent as compared with the proceeds of the note. The point is that if there is an overage of 20%, 33 1/3% or 50% as the case may be, this overage is really carried by the dealer and it often drains the dealer of his capital before he realizes what is happening to him.

For instance, assume a concern selling $5,000 per month on term payments and discounting with a financial agent that loans only 70% of the collateral security. The dealer will be doing an annual business of $60,000 and if he sells on 12 months to pay he will have on the average $30,000 of contracts pledged with the financial agent, since on the average his contracts are one-half paid-up, and he will owe the agent an average of .7 × $30,000 or $21,000. however, neglecting his profit, it takes $9,000 more money than the $21,000 to keep him going, since he has paid for the goods and the expense of selling them represented by the $9,000 excess, and this can come from no other source than the dealer's own capital, since the excess of contracts is already pledged as security for the $21,000 loan. Such a dealer would require a capital invested in his business of $9,000 to cover the overages of lease contracts held by the financial agent and in addition thereto the cost value of his inventory and of his store fixtures. This explains why dealers see their capital frittering away they know not where, and fail to realize until too late that it takes a great deal of their own capital to sell on term payments in addition to the proceeds of the notes of the financial agent.

However, there are certain financing agencies that have a plan that requires no excess or capital investment such as the $9,000 referred to in the above paragraph. They take over each contract as it is made as a separate transaction, purchase it outright, and collect the instalment account if it seems desirable. The dealer possesses no direct liability, only a contingent liability to repurchase the contract in the event the agency cannot collect. The dealer's capital is unimpaired and he obtains his full operating profit immediately from which he pays salesmen's commissions and operating expenses and pockets his profit.

A word as to collecting instalment accounts. Most financing plans leave it optional with the dealer whether or not the collections are to be made at the store or by the financing agent direct. It seems to the writer that undue emphasis is laid on the importance to the dealer of having the payments made at the store. There are many advantages of having payments made out of town or by third parties. The customer does not demand so much free service, and it is a fact that the customer will be more prompt in payments to an outside concern or fiscal agency than to the dealer from whom the goods were obtained.

Another important point on this subject of financing term payments is that it is far better for the dealer to use financing plans that have a connection with the manufacturer of the goods that he is selling, than it is to use outside financial schemes. Even though this necessitates the use of a different form of order blank for each class of goods sold, that is a minor detail compared with the feeling of security that comes from using a plan having a connection with the manufacturer. There is nothing whatever to prevent an outside financing agent cutting off the discount privilege at any time, and in days of money stringency or hard times this is likely to happen. In such a case the dealer is left high and dry, whereas the manufacturer of the goods that the dealer is selling will hesitate greatly before permitting his affiliated financing company to cut off the dealer's line of credit, as to do so would stop the sale of his own goods.

Servicing the Appliances

A constant leak in carelessly run appliance stores is free service. The customer says she won't make any more payments until her wringer roll is repaired, etc. The easiest and usual thing to do is for the dealer to make the repair or adjustment without charge. Manufacturers, too, have abetted this evil by being exceedingly liberal in supplying repair parts without investigation as to whether or not the replacement should come under the guarantee. The true source of complaint of some dealers that their profit margins are insufficient can be traced to this free service which has been unwisely fostered.

Experience in other businesses may be a guide. The farm tractor business of the country has been largely lost to the old-line farm implement dealers because they had an ingrained notion that they should give free service. Instead, this trade has gone to the automobile dealers or special tractor dealers simply because they have built up their business on the slogan of **no free service** and they show a profit upon margins very much smaller than exist in the electrical appliance field. The farm lighting plant builders are spreading the slogan that their dealers will not be able to survive if they give free service.

A proper policy is first of all to handle only goods that experience shows require a minimum of service and then to declare a definite policy that all service after the first 90 days shall be paid for. At the end of 90 days the customer will have a fair-sized amount invested in her appliances and will not be so likely to tell the dealer to come and take it away. During the 90 days she may have one or two service calls, but they will offer an excellent opportunity for instructions and may be considered as a part of the sale. After 90 days, free service should never be given, but on the other hand high priced service charges should not be extorted. Also take a tip from the automobile industry, and get your service man to make a written estimate of the cost of repairs and have this estimate O.K.'d by the customer before any work is done. A reasonable charge, but always a charge, should be the slogan. Excessive charges will kill your prospects of additional sales in the immediate neighborhood.

New Features of the Cedar Falls Pipe Line

BY F. R. NICHOLAS

(The fullest and most economical use of the existing water supply has been the subject of especially serious consideration during the present dry year. The following paper by the locating engineer with the Seattle Municipal Light and Power System, which was presented at a meeting of the Seattle Section, A. I. E. E., gives interesting structural details of the new Cedar Falls pipe line planned with a view to more thorough utilization of the water for hydro-electric generation.—The Editor.)

In order to utilize the major portion of the surplus and flood waters of the Cedar River watershed for additional power development and enlargement of Cedar River municipal plant, the city of Seattle authorized by ordinance the installation of an additional hydro-electric power unit at Cedar Falls, consisting of a wood and steel penstock, 12,500-kw. generator with exciter, turbine, gate valves and usual accessories.

Existing gate house, pipe lines Nos. 1 and 2, showing opening for connecting pipe line No. 3

Trestle across Canyon Creek. By means of this structure the length of the pipe line was reduced 70 ft.

Selecting Location

After the pipe line surveys to determine the best route between the masonry dam and power house, several plans were submitted. That selected provides for location beginning at the west end of Intake tunnel and along the north bank of Cedar river to Canyon creek, the line lying below pipe lines Nos. 1 and 2 for a distance of 2600 feet, thence from Canyon creek over the summit to the power house. This location is 7474 feet in length, requiring 5306 feet of wood stave construction and 2168 feet of riveted steel pipe.

General Structure

The alignment of the line shows 8 simple and compound curves, ranging from one degree to ten degrees, the latter being the curvature limit, or a limiting horizontal and vertical radius of 573 feet. There are 9 tangents, the longest being 1760, the ratio of tangent to curvature being 75 to 28, or 2/3 tangent to 1/3 curvature. This is a gratifying economical relation when the cost of bending and springing wood stave pipes of large diameter is considered. The grades were established with this point in view, that the highest possible hydraulic efficiency might be obtained. The reduction of all sharp angles was obtained by the application of transition or spiral curves applied vertically at such points. No point on the line approaches even near the hydraulic gradient, so that the penstock may stand a heavy overload without danger of the water column parting on the summit, as now frequently occurs on pipe lines Nos. 1 and 2 when overload is imposed on the lines.

The diameter of the penstock is 78 in. inside measurement, applying to both wood and steel sections, and is designed to deliver 310 cubic feet of water per second at normal velocity of 10 ft. per second. This velocity is accelerated as the penstock diameter decreases to 66 in. at the turbine flange, the velocity at the turbine being 14 ft. per second.

The head loss due to frictional resistance is 4.16 per 1000 ft. of pipe line, giving total head loss of 31 ft. under full load of 12,500 kw. with velocity of 10 ft. per second—and a head loss of but 8.5 ft. for 6250 kw. with velocity at 5 ft. per second. The effective head at rated load of 18,000 hp. is 580 ft., with a guaranteed efficiency of 86% at 16,000 hp.

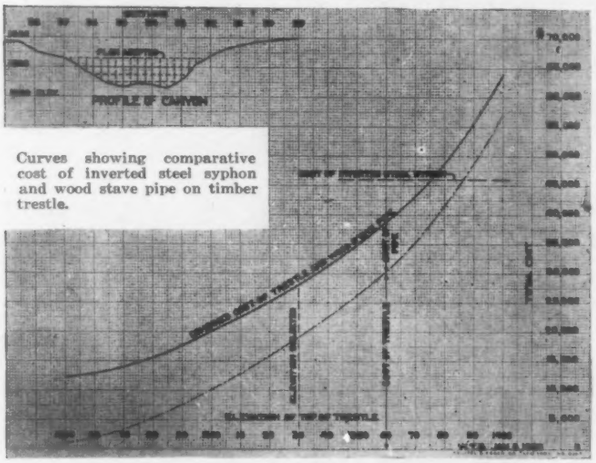
Special Features of Wood and Steel Sections

The wood pipe section is supported on 3 x 12 x 12-ft. creosoted sills laid flat and spaced 8 ft. centers, bedded securely into the pipe trench or attached to trestles as the case may be and locked to the roadbed with 12 x 12-in. saddles. No part of the pipe comes in contact with the soil or earth. It has been proved beyond a reasonable doubt that a wood stave pipe exposed to the air has a longer life than one buried or covered, as has been the practice for many years past. This is one of the new features of this installation.

The wood pipe section requires 640 tons or 24 carloads of steel bands, seventy thousand cast steel shoes weighing 245,000 lbs. (123 tons, equivalent to 6 carloads) and one hundred and ninety thousand lineal feet or 380 M. feet B.M. of 3 x 8 in. stave stock in lengths from 10 to 20 feet.

The wood stave section ends at Sta. 53-06, which corresponds to a pressure of 250-ft. head. From this point on to the power house 2168 ft. of triple riveted

steel pipe is used, varying in thickness from ½ in. to 1-1/16 in. at the power house. Plates are rolled in one sheet with the long seam riveted above the horizontal diameter; triple riveted, double butt straps are used for longitudinal seams, single row rivets for girt ends on upper section, and double row rivets for girt seams on lower sections. The steel is fabricated at the mill and shipped in 16-ft. to 21-ft. length. The steel section is supported on concrete



Curves showing comparative cost of inverted steel syphon and wood stave pipe on timber trestle.

saddles and securely locked in position by numerous concrete anchors, located principally at grade intersections.

The Surge Tank

On account of the length of the new pipe line and the quantity of water it is designed to carry, it would be desirable to provide a suitable surge tank for regulating purposes. The proposed surge tank is to be located on the apex of the hill above the power house. It consists of a cylindrical steel tank 25 ft. in diameter and 199 ft. in height, connecting with the 78-in. penstock by means of a 48-in. riveted steel pipe. The 48-in. connecting pipe has a tendency to suppress surges in the line caused by changes in velocities.

The surge tank has sufficient capacity to conserve the water rejected at times of sudden decrease in load. It is designed to supply the full capacity of the pipe line for a period of 70 seconds in case of sudden demand.

Improvements Over Old Lines

Comparing the new penstock now being constructed with No. 1 and No. 2 lines, we find the new line to be 307 feet shorter, and crossing the summit through a pass 57 feet lower than the present lines. At this point the new pipe line is 126 feet below the hydraulic gradient.

The sub-structures and foundation upon which the entire pipe line is carried are composed of pile and wooden frame trestles of two different types, and open trench excavations. One-third of the line is supported on wooden structures, made necessary by the fact that the line lies on a steep side hill, having a slope of 35 to 60 degrees. All frame trestles have concrete footings on solid rock foundation. Every precaution possible was taken to make the line safe and secure from washouts which might occur at any time from the two lines above.

Where the pipe line crosses Canyon creek the type of construction using wood stave pipe on a wooden frame trestle was selected. By this method the length of line was reduced 70 feet, and the maximum head on the pipe line at this point was reduced from 340 to 240. This resulted in the saving of approximately $18,000.

The bridges were designed for a load of 1.5 tons per running foot of bridge floor system, made rigid to prevent deflection, and span lengths 25-ft. center to center between bents, using safety factor of 6.

Due to the introduction of long spans the lumber bill was virtually reduced 50%. This departure from ordinary practice of 14 to 16-ft. span lengths for trestle bridges may also be considered as a new feature relating to pipe line construction.

Increased Power Supply

The fundamental idea of this new installation was to utilize the flood and surplus waters of Cedar river impounded back of the concrete dam. The plan was based on the assumption that the sealing operations for forebay basins would be effective, and the major portion of the annual run-off waters be used for development of additional power through this new unit.

After two years of work on the sealing operations and the expenditure of a large amount of money for this purpose, results are most discouraging as the seepage curve this past winter shows a slight increase in seepage over preceding years. To make this new unit efficient requires that the forebay basin be practically sealed. To meet this perplexing situation, a plan recently recommended proposes an extension of the Intake tunnel, through the hill to Cedar lake, tapping the lake at an elevation some 45 ft. below the present surface. By this plan there can be developed at nominal cost approximately three times the present power output of the plant at Cedar Falls. The new penstock now under construction could operate in conjunction with this proposed tunnel at any season of the year.

The present water supply from Cedar lake provides for 6,000 kw., continuous. The present installation at Cedar Falls has a total capacity of 11,000 kilowatts. Adding to this the new unit of 12,500 kw., we have a total capacity of 23,500 kw. The proposed tunnel plan provides 80,000 acre-feet of storage capacity which is sufficient to regulate the stream flow so as to give 500 second-feet continuous.

A. I. E. E. ENTERTAINMENT

Although the engineer generally does not give a thought to such distractions as poker or golf, this is not because he does not know how. As a matter of fact the engineer enjoys relaxation and the entertainment committee of the Pacific Coast Convention of the A. I. E. E. has taken this into consideration by providing various outdoor sports for the guests at Portland on July 21 to 24. Among these will be a golf tournament to compete for the cup offered by the several electrical firms in the Northwest. This has been designated the John B. Fisken Cup as a tribute to Mr. Fisken's activities in the electrical field.

Office Records—Their Filing and Indexing

BY IRENE WARREN

(A number of simple and easily installed methods of filing special types of material are explained in this last of the series of articles by the president of the Chicago School of Filing and Indexing. The correct system of handling the correspondence and data of a sales department is outlined to suggest methods of organizing any specialized material.—The Editor.)

FILING SPECIAL RECORDS

The filing and indexing for a corporation might be compared to an electric lighting system, the central filing staff being the dynamo and the central and departmental files the lights. And furthermore, the filing system, properly handled, certainly produces informational light.

An idea of how carefully the wires for this informational lighting system must be laid in order

The Library and Information Bureau of the National Safety Council. The collection of books and serial publications to the right are filed on steel shelves. Serials in pamphlet form are placed in pamphlet boxes. In the rear of the room is the data file which consists of clippings, blue prints, typewritten sheets, reports and miscellaneous material. This is arranged alphabetically by subjects in forty-eight legal size drawers. Duplicate copies of pamphlets are placed in the pamphlet boxes which are stored on steel shelving in the back of the room. A complete card index of these materials is filed in steel cabinets in a steel safe.—Photo by Burke and Friedmann.

that light may efficiently cover every nook and corner of the business and give the proper intensive service where it is needed, may be had by scanning the typewritten and printed materials needed in operating a large manufacturing plant, as shown below.

Files and Indexes in a Manufacturing Plant

Correspondence, form letters, departmental reports, sales records, inter-office correspondence, special memoranda, special instruction sheets, comparison and classification reports, follow-up systems, superintendents' and foremen's reports, employment records, contracts, sales bulletins, salesmen's reports, foreign orders, repair orders, mail order blanks, stock room reports, requisitions, quotations, raw material records, traffic reports, bills of lading, warehouse reports, storage receipts, production records, cost tickets, pay roll sheets, vouchers, bonus sheets, expense accounts, collection reports, petty cash slips, correction slips, time sheets, advertising records, plans, blue prints, sketches, drawings, lantern slides, periodicals, pamphlets, trade catalogs, public documents and books.

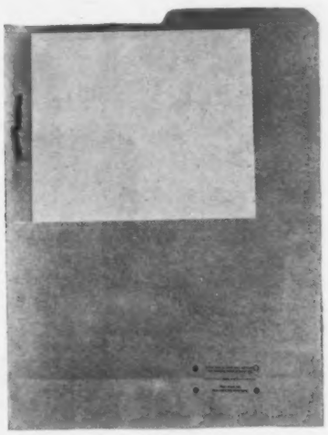
An absolute essential is that heads of departments make it part of their business to explain to the filing supervisor definitely the exact nature of the service wanted. If the supervisor is properly trained in system work, let him install the system and keep it in repair, just as the lighting is left to the electrical expert. So much of the difficulty existent today lies in the fact that department heads do not take the trouble to work out the details of what they need and the file clerk or some one else with only part of the necessary information does the best he can, in haphazard fashion, to devise a system. Very definite relations between the heads of departments and those of the supervising file clerk should be maintained.

Organization of Department Files

In this brief account only an outline can be given of how the records would be filed in but one of these departments, but this should be suggestive to all other specialized lines. The sales department has been chosen because its records are so necessary, so varied, and so constantly in use.

Correspondence: Sales correspondence is usually best arranged in an alphabetic name file, or geographic file; occasionally a numeric is used. The geographic is preferred if the sales cover a wide area. The letters from the salesmen are grouped together, but all letters from each salesman filed together.

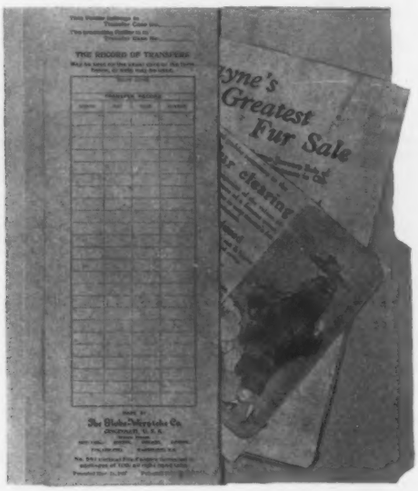
Reports from salesmen: Usually each firm has its own printed forms, thus insuring a complete and uniform record on each sale. These forms are made up in pads. The salesman uses a carbon sheet, making the record in duplicate, one copy to be retained by him and the other sent to the sales office.



A folder which securely binds the valuable credit information concerning each individual customer.

Bills and invoices: These may be filed in the correspondence folders, but a better method is to place those for each firm in a separate folder which is filed back of the correspondence folder for the firm and distinguished from it by means of a colored label.

Card records: Card records are necessary in this department and many desirable classifications may be made through the use of a single card system if tabs, colors, and signals are properly used. In

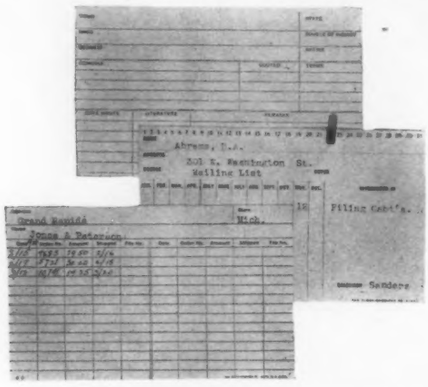


A reinforced, expansion folder convenient for filing unmounted photographs, clippings and miscellaneous data.

large corporations this information may be better divided into several card systems so that groups of workers may more readily get to the cards.

Follow-Up System in Sales Departments

An adequate follow-up system is an essential to the sales department. This may be kept through the duplicate copy of letters sent to customers or through a follow-up card record. A tab on the card indicates the prospect and this tab is cut off when the prospect becomes the customer; or, a distinct record for prospects and customers may be kept by reversing the card and placing the customer's record by itself. The prospects and customers may thus be kept in one straight alphabetic or geographic list. Follow-up work is done by the use of signals. The



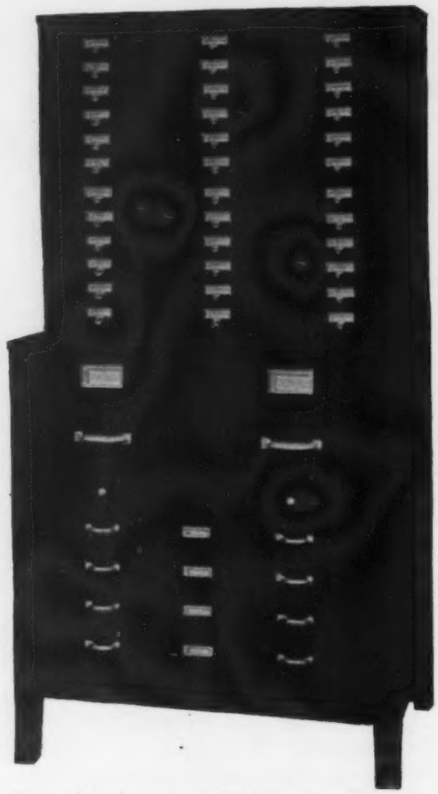
Cards used in systematizing the follow-up work of a sales department

customer's record gives the main items regarding sales made so that the sales manager may see at a glance the relation of his department to the customer. In large corporations the follow-up work and the summarized sales record are better on separate cards. A further classification of customers by agents, dealers and jobbers may be made through the use of colored cards or tabs.

The salesmen's route cards, giving their addresses as they change from day to day, are filed alphabetically by the salesmen's names.

Maps: By means of a large wall map or a series of small maps kept in shallow drawers, the manager may keep track of the routes of the salesmen and the progress of sales made in a given town.

Credit information: Credit information regarding customers is collected from various sources and is recorded on specially prepared blanks, in letters, from memoranda furnished by salesmen and from mercantile agencies' reports. This is confidential material and is usually filed in the credit department section. All the papers on a given customer are kept



File cabinet for cuts and electrotypes. The upper section is for halftones, etchings, electrotypes and other printing plates. The middle section is for drawings, and the lower section for large drawings.

together and are usually fastened into the folder so that none may be detached or lost. These may be kept alphabetically by the customer's name, geographically, or numerically with an alphabetical card index to the numbers. A recapitulation of this information is often made in a card index which saves time in looking up many of the points needed. On this card, signals may easily be placed to indicate changing conditions that may occur in the customer's credit.

Library or research department: In the research or business library (so often started in the advertising section) may be found a collection of technical books, some books for general reference, a

large number of public documents, miscellaneous pamphlets, trade catalogs and periodicals. These are sometimes supplemented by a large collection of books loaned by the public library for distribution among the employes, the idea being that books are a definite agency for good among employes in the same manner as are gymnasiums, recreation rooms and other like agencies used for the employes' welfare. If the library collection is a large one the services of a trained librarian should be employed permanently, or if the library is not sufficiently large to warrant this, a librarian who has specialized in this phase of library work may be secured for the organization of the collection and recalled from time to time to arrange and index new material and keep the attendant in touch with the best methods of handling her materials.

Data file: Clippings from newspapers, from magazines not bound, typewritten memoranda, briefs of surveys and experiments are valuable and should be filed according to subject. Sometimes the public documents and other pamphlet literature are filed with the data. This is arranged either by a decimal scheme or by an alphabetic subject plan.

Advertising records: Copies of advertising placed are kept and may be arranged by the name of the publication, where advertising appears or by the item advertised.

Drawings and photographs: May be kept in vertical, legal size files or if large, should be placed in a large file made for that purpose such as architects use for their large drawings. These may be arranged alphabetically by subjects or by a numerical scheme with a card index.

Cuts and electrotypes: File these in shallow drawers with the face up. They are usually best arranged according to a numerical plan with a card index. The number is placed on the side of the block bearing the illustration. Sometimes the unmounted plates and even the mounted plates are placed in folders and arranged in vertical files. A print of the cut is placed on the outside of the folder.

Advertising orders: An alphabetic card index of the orders placed is kept which gives the name of the publication, space copy is to cover, length of time advertisement is to run and other details needed. Signals are used to indicate expiration of contracts. Signals, tabs on cards, or colored cards may be used to classify publications where orders are placed.

This series of articles, which has been running in the Journal of Electricity during the last six months, has been addressed to both operators and users of filing and indexing systems because we have as yet no large, well-defined group of intelligent file clerks. Every one takes a turn at the files, from the office boy to executives, which accounts for the chaotic condition of records in many places. But it is hoped that these articles have had one message to all who are interested in adequate filing methods, and that message is: We must give file clerks definite training for their work if we are to have efficient files.

Western Ideas

THE ARRANGEMENT OF BUSINESS LETTERS does more to make them readable than any other factor. The letter shown below, which was sent out recently by the California Electrical Construction Company, is a splendid example of the type which commands the reader's attention through the attractive and artistic arrangement of the information they wish to give their patrons in announcing a move to new quarters.

A more or less familiar quotation in large letters at the top of the page is certain to get the attention of the busiest man, and he then involuntarily reads the short tabulated sentences below. A different arrangement is used to draw special attention to the new address which is placed in the center of the page.

CALIFORNIA ELECTRICAL CONSTRUCTION CO.

ELECTRICAL SPECIALISTS

April 14, 1920.

Journal of Electricity,
Rialto Bldg.,
San Francisco, Cal.

Gentlemen:

"HE PROFITS MOST WHO SERVES BEST."

In order to "Serve"
We have found it necessary
To make a few changes
Not in our business
But in our location.

ELECTRICAL
ENGINEERS
CONSTRUCTION
MOTORS
SUPPLIES

NOTE NEW ADDRESS: Phone Sutter 2740.
687 Mission St., San Francisco.

OUR REASONS FOR CHANGING:

We are now on the ground floor.
We are able to display our lines.
We have better facilities in our stock-rooms.
We can now handle our men and material to the
Best advantage of ourselves and our customers.

Very truly yours,
CALIFORNIA ELECTRICAL CONSTRUCTION CO.
W. L. Chamblin
Manager.

The letter sent out recently by a Western firm to announce its move to a new location. This is an example of how attention is attracted and held by ingenious letter arrangement.

"THE WORLD'S MOVING when it begins to Admit Its Mistakes," is an advertisement published recently by Crowley, Milner & Company of Detroit. It is an example of the way local stores are using advertising space to correct errors which have appeared in their announcements, and they do so with the firm conviction that the building of good will is the greatest service which their advertising can render them.

The confidence of men and women can be gained most quickly and surely by admitting honestly mistakes of any sort which have been made. And so the firm which wishes to gain public confidence should realize that it can best do so by frankly calling attention to errors which have crept into its advertising columns and as frankly admitting them.

Trend of Regulation

BY CARL D. JACKSON

(In view of the pressing problem of financing new developments, few questions are of greater interest to the electrical industry than those of commission regulation and rate fixing. Following are a few interesting extracts from the able speech delivered by Commissioner Jackson of Wisconsin at the Pasadena N. E. L. A. Convention.—The Editor.)

It has become increasingly apparent in recent years that the problem of economic production and distribution of essential products depends for its solution upon the use and distribution of natural forces by electricity.

* * * *

After all, every question of the wisdom or policy of private or government ownership and management must be solved with reference to the underlying problem. Under which policy will the people as a whole receive the greatest economic benefit? Which policy will bring to the industry that enterprise, development and economic and efficient management that will in the end be reflected in conservation and full use of resources?

* * * *

Regulation must not only perform its functions of assuring to the public fair and reasonable treatment in all matters of service, safety and rates, but must also broadly exercise its general functions to encourage and reasonably reward those supplying the energy, enterprise and capital, without which the highest development is impossible. The industry must be attractive, or it will not flourish.

* * * *

The very pressing problem has been to meet the extraordinary, threatening and sometimes discouraging conditions in relation to public utilities that have been the outcome of the war. The extraordinary present interest rates for public utility securities, intrinsically sound, are a great handicap to extension and absolutely necessary development.

* * * *

The assignment of a constantly fluctuating value to property devoted to a public use has nothing to recommend it from my point of view. To the owners of public utility property, it may offer for the time being highly speculative rewards, but just as surely promises unreasonable losses and failures and unnecessary risk in enterprises which if wisely undertaken and managed should offer fairly sure and stable rewards. A fluctuating value may be attractive to those who see their reward only through shrewd manipulation of securities, but will not appeal to those who seek the rewards reasonably due to those conceiving large public enterprises in a public spirit for the mutual advantage of themselves and the public.

* * * *

The matter of valuation in rate cases is not an end in itself, but only a step in arriving at the end, which, within the limits of reasonableness, is the amount of compensation to be allowed the capital employed in the business. It has been repeatedly stated that the return which a public utility company should be permitted to earn under normal circumstances should be such a return as will permit the free flow of capital into the utility business. In the end, therefore, the amount of return resolves itself into a matter of compensation for capital presently employed or about to be employed in the business, and it is self-evident that if the rate or amount of return is adequate to provide proper compensation and attract capital, there is no object in changing the rate base from time to time, except as the amount of capital employed changes. On the other hand, if the rewards for capital employed are not sufficient, no matter what the rate base used, there will be a failure of enterprise and development resulting in inadequate service and in the end in unnecessarily high rates to the public.

* * * *

The concept of value as wholly analogous to exchange or commercial value of marketable commodities has, I believe, led directly to a misconception of the effect of accrued depreciation in arriving at a rate base. Everybody knows that a used machine or automobile is not as valuable and will not sell for as much as a new one. Why should public utility property not be subject to the same exchange or commercial laws? And if value is exchange, commercial and fluctuating, it is hard to explain why commercial and exchange elements relating to use should not be an applicable factor. If, however, you exclude this concept of exchange value and think of value as closely related to legitimate investment, which in turn represents the sacrifice made by the owners of the utility, the mind is at once freed from this question, and the question of accrued depreciation; that is, accrued liability to replace, immediately becomes connected with the question of depreciation reserves, failure to set aside depreciation reserves where they could reasonably have been set aside, and the question of return to the investors of a part of the investment made by them. If value in the long run is somewhat analogous to investment, then every rule of equity demands that the question of accrued depreciation shall be considered in connection with the question of the investment still in the utility.

* * * *

It is fundamentally true that the people as a whole have a keen sense of justice and right, and in the long run will with full understanding generally arrive at a correct decision. The difficulty is in getting the full facts before the people, and this is especially so in matters disputed before commissions. It may often occur that the people do not realize the benefits which they themselves have received from regulation. The people are entitled to and will insist upon reasonable rates, but they are willing to pay for good service.

SPARKS—Current Facts, Figures and Fancy

(The electric scrubbing brush, curling iron, cigar lighter and sewing machine are among the various novel devices mentioned on this page. Have you heard how much the French plan to spend on railway electrification in the next few years or what Brazil is planning in the way of hydroelectric development? These and other similar bits of electrical information appear below.—The Editor.)

The Ford Company is now putting out over 3,000 cars a day, three times as many as a year ago.

* * *

On dark nights a white light can be seen farther than any color; on bright nights red takes the first place.

* * *

Hotels are installing the nickel first electric fan which operates for an hour on one nickel. The cheapest comfort on the market.

* * *

The longest telegram ever sent was on May 22, 1882, when the entire New Testament as revised was sent from New York to the Chicago Tribune.

* * *

Some mothers have found that a brush screwed into the shaft of a sewing machine motor makes it possible to clean the blackest spots on Johnny's clothes with no other rubbing or scrubbing.

* * *

The electrically-propelled sewing machine may be especially recommended to the economical housewife on the ground that it costs no more to operate a sewing machine motor than for the glow of one electric lamp.

* * *

The comfort of street car passengers is greatly enhanced in the city of Los Angeles which is the first city in the United States to lessen street noise by using a shockless street car crossing, which is also practically noiseless.

* * *

The electric curling iron ranks among the most versatile of domestic electric appliances. It has recently been discovered that this piece of boudoir apparatus may successfully be used to heat a glass of water or to warm the baby's bottle.

* * *

The electrification of French railroads which is planned to take place during the next few years will amount to an expenditure of 2,700,000,000 francs. It is estimated that a saving of 1,500,000 tons of coal a year can be effected by this electrification.

* * *

Tele-photography is the latest and most startling of recent radio inventions. A system is being perfected by which a picture is built up by dots of varying magnitude, each of which has a special code letter so that photos can be telegraphed, cabled or radioed practically any distance.

The air mail has been in operation for twenty months, carrying to date more than 22,000,000 letters between Chicago, Cleveland, New York and Washington, at better than twice the speed of the Congressional Limited or Twentieth Century.

* * *

Plans which are being made for the electrification of foreign railroads are surprisingly wide in their scope. Extensive projects are soon to be carried out in Italy and South America and it is expected that Portugal will follow in Italy's footsteps.

* * *

A device has been perfected which makes it possible to detect the presence of icebergs by measuring the amount of salt in currents of sea water. The vital part of the device is an electrolytic cell which measures the electrical resistance of ocean water by the aid of alternating current.

* * *

California crude oil stocks were reduced from 24,432,175 barrels, May 1, to 23,914,537 barrels, June 1—the actual reduction being 517,638 barrels for the month. These statistics show the daily shortage for the month to be 16,698 barrels, an increase of 2,222 barrels over the April daily shortage of 14,476 barrels.

* * *

Men working outside where wind extinguishes matches before the sulphur tip is burned find electric cigar lighters highly satisfactory, while the business man is able to keep a neat nickel-plated case in his vest pocket, always ready for use, without having his garments littered with an assortment of broken and mouldy matches.

* * *

The Government of Brazil is financing a survey of the hydroelectric possibilities of the Iguazu falls in the northeastern corner of that country. According to the present plans, 150,000 horsepower is to be developed from the falls, this amount later to be increased to 300,000. The power will be transmitted over an 800-mile stretch to Buenos Aires.

* * *

The number of ocean-going commercial ships passing through the Panama Canal during the month of April was 220, inclusive of 10 United States Navy vessels, 2 United States Army vessels, 4 merchant ships with coal for the Navy, and 1 British tug with negative United States tonnage. The net tonnage, Panama Canal measurement, of the 220 commercial vessels aggregated 822,471—3,109 tons greater than for the preceding month.

PERSONALS

James H. Bonner, chief engineer of the Montana Railroad commission, is assisting in an unusually helpful manner in gathering data for the Montana Railroad Commission whereby utilities of that great commonwealth may be put on a better and firmer financial footing due to the present increase in cost of production. Details of this interesting work will be found elsewhere in this issue. Mr. Bonner is a graduate of the University of Montana with the class of 1907, where he received his major engineering work under the direction of Robert Sibley, editor of the Journal of Electricity, who at that time was head of the Engineering School at the University of Montana. Since graduation Mr. Bonner served for a number of seasons as county engineer for the county of Missoula, Montana, in which he acquired a broad engineering knowledge. Later he engaged in quite an extensive consulting engineering practice. He served during the war as a captain of engineers, and upon returning from service entered employment with the Montana Railroad Commission where he has for the last two years been serving as its chief engineer. Mr. Bonner represents the younger type of engineer in public service, and with his constructive thoughts and ideals many new and practical good things for the utility life of the state of Montana may be expected to follow.

Joseph E. Johnston, advertising representative of the Journal of Electricity for the New York district, is a Pacific Coast visitor.

C. R. Churchill, president and general manager of the Electric Appliance Company of New Orleans, Louisiana, is a recent San Francisco visitor.

S. Hall Roosevelte, railway engineering department of the General Electric Company, Schenectady, has recently visited the San Francisco office of the company.

G. C. Pierce, vice-president and general manager of the Northwestern Electric Company, is in San Francisco on business in connection with interests of the Northwestern Electric Company.

H. F. Jackson, vice-president and assistant general manager of Pacific Gas & Electric Company, has recently gone to New York in connection with the sales of securities of the Sierra and San Francisco Power Company, of which he was president.

Willard S. Sisson, secretary and treasurer of the D & W Fuse Company, Providence, R. I., severed his connection with the D & W Works on June 15th, as the plant is now operated by the General Electric Company under a long term lease. Mr. Sisson will continue in the electrical business, and will announce his plans in the near future.

M. C. Osborn, who is well known to all Pacific Coast electrical men and for many years commercial manager of the Washington Water Power Company at Spokane, and for the past year associated with Landers, Frary and Clark at New Britain, Connecticut, has resigned his position with that company. At the present time he is visiting his son in Seattle, Washington.

E. W. Garcia, after ten years' experience with the General Electric Company with headquarters in San Francisco, has become associated with the Pacific States Electric Company and will have charge of incandescent lamp sales. Mr. Garcia has left for the East to spend some four weeks in visiting factories and research laboratories concerned with lamp manufacture.

J. A. Vandegrift of the National Lamp Works, Oakland, California, has been East attending the annual Sales Conference of the various sales managers of the National Lamp Works which was held in Cleveland, Ohio, and also for the annual meeting held on Association Island, Lake Ontario, New York. When Mr. Vandegrift left for the East he intended to return about the first of July.

The following western engineers have been elected to associate membership in the American Institute of Electrical Engineers: **B. P. Bailey,** District Manager, Pacific Power & Light Co., Astoria, Wash.; **C. G. Batt,** Chief Electrician, Utah Apex Mine, Bingham Canyon, Utah; **W. S. Boutwell,** Service Engineer, Westinghouse Electric & Mfg. Co., Seattle, Wash.; **B. W. Creim,** Test Dept., Bureau of Power & Light, Los Angeles, Cal.; **R. C. Denny,** Operating Engineer, San Joaquin Light & Power Corp., Fresno, Cal.; **J. M. Evans,** Salesman, Westinghouse Electric & Mfg. Co., Fresno, Cal.; **H. M. Fowler,** Electrical Engineer, Westinghouse Electric & Mfg. Co., Seattle, Wash.; **W. H. Keyser,** Sub-Foreman, Electric Construction, Puget Sound Power & Light Co., Seattle, Wash.; **E. F. Maryatt,** Electrical Draftsman, Stone & Webster, San Francisco, Cal.; **J. C. McDougall,** Engineer, Westinghouse Electric & Mfg. Co., Seattle, Wash.; **E. M. Moore,** Local Manager, Washington Coast Utilities & Vashon L. & P. Co., Portage, Wash.; **O. B. Moorhead,** President & Chief Engineer, Moorhead Laboratories, Inc., San Francisco, Cal.; **A. K. Morehouse,** Division Equipment Foreman, Pacific Tel. & Tel. Co., San Francisco, Cal.; **W. A. Murray,** Instructor in Electrical Engineering, Univ. of Idaho, Moscow, Idaho; **J. G. Pomeroy,** Electrician, City Light Dept., Seattle, Wash.; **L. W. Ross,** Telephone Engineer, Pacific Tel. & Tel. Co., Portland, Ore.; **D. F. Smith,** Transmission Engineer, Pacific Tel. & Tel. Co., San Francisco, Cal.; **G. H. Smith,** Engineer Outside Construction, City of Seattle Lighting Dept.; **H. M. Snow,** Operator, Hartwig Theatre, Dillon, Mont.; **H. K. Townsend,** Chief Clerk to Electrical Engineer, S. F. O. T. Railways, Oakland, Cal.; **F. H. Viets,** Division Engineer, Research Corporation, Anaconda, Mont.; **R. L. Von Lossow,** Engineer Service Dept., Westinghouse Electric & Mfg. Co., Seattle, Wash.; **C. A. Wells,** Engineer, Pacific Tel. & Tel. Co., San Francisco.

E. F. Whitney, manager of the lumber industries department of the General Electric Company, Portland, Ore., and chairman of the Portland section of the American Institute of Electrical Engineers, is attending the annual convention of the Institute which is held at White Sulphur Springs, West Virginia, June 29 to July 2, as the official representative of the Portland section. On his way to the convention Mr. Whitney passed through California where he stopped for several days gathering information in the interests of the important lumber industry in the Northwest. As the hosts to the Pacific Coast Convention of the A. I. E. E., the Portland section is making extensive plans for the entertainment of a large number of delegates, and it will fall largely to the efforts of Mr. Whitney to make this convention a success. This photo of Mr. Whitney was intended for the pages of this issue devoted to the Western Engineers, but was received too late for that purpose.

Henry Suzzalo, president of the University of Washington, was one of the forceful speakers at the recent Foreign Trade Convention in San Francisco, and also on the evening devoted to Public Policy discussion at the Pasadena Convention of the National Electric Light Association. Mr. Suzzalo is one of our active factors in the West in the development of more intimate relations between the university and the industrial life of the West, and he has in the Northwest proven a most helpful factor in the settlement of industrial disputes, in the arbitration of the electric railway labor troubles and in many other matters of service to the industry and to the commonwealth. Mr. Suzzalo is a graduate of Stanford University with the class of 1899. Since graduation he has devoted his energies to the development of educational matters, in which he has won his present position of eminence in the educational and business world.

Girard B. Rosenblatt, electrical engineer and specialist in mining and metallurgical applications with the Westinghouse Electric and Manufacturing Company, announces the removal of his office to 521 First National Bank Building, San Francisco.

L. E. Kurtichanof, formerly electrical engineer for the Standifer Steel Shipyard at Vancouver, Washington, has resigned his position and will open up a battery service station at Tenth and Davis streets, in Portland, having secured the state agency for the "Titan" battery.

L. W. Chapman, western editor of Chemical and Metallurgical Engineering, who during a recent trip through the Northwest made a careful study of the possibilities for the development of electro-chemical processes, reports that the present conditions would not warrant great increases in this branch of the industry until the magnitude of the manufactories assured is sufficient to make the development of some of the larger water powers economical.

H. W. Crozier, local manager of Sanderson and Porter, has recently returned from France where he designed an oil pipe line to run from Havre to Paris. This line will transport the Mexican oil brought into the port of Havre direct to Paris where it will be used to take the place of coal, as that commodity is very scarce and the price almost prohibitive. Mr. Crozier designed the Coalinga-Martinez pipe line and stated that the new line will practically duplicate it.

John H. Wilson, mayor of Honolulu and a graduate of Stanford University, has been elected president of the Honolulu chapter of the American Association of Engineers. The vice-president of this newly formed chapter is Lyman H. Bigelow, superintendent of public works and chairman of the Board of Harbor Commissioners of the Territory of Hawaii, and a graduate civil engineer from Cornell University. This newly formed chapter has forty-four members and is the second chapter of the Association to be formed outside of the United States, the first being located at Anchorage, Alaska.

G. J. Young, Pacific Coast editor of the Engineering and Mining Journal, has just completed a four weeks investigating trip through the Birmingham, Ala., and southeastern Arizona mining districts where he made a study of conditions particularly appertaining to the installation of electrical apparatus. Mr. Young noted great progress in these districts. In Alabama the use of electrically driven machinery is only now getting a foothold in the mining industry. In Arizona a large part of the power is electric, although there remains much to accomplish in substituting motors for steam engines.

L. S. Ready, assistant chief engineer of the California Railroad Commission, has been sent to the annual convention of the American Institute of Electrical Engineers as the representative of the San Francisco section. Mr. Vincent, chairman of the section, was unable to attend the meeting.

John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, gave the opening address at the recent formal dedication of the Electrical Home which has been built at 25 Junipero Serra Boulevard, St. Francis Wood, San Francisco. The Home Electrical, a modernly built and equipped electrical home, has created great interest throughout the San Francisco Bay region.

T. E. Burray, vice-president of the New York Edison Company, president of the Yongers Electric Light and Power Company and vice-president of the United Electric Light and Power Company, recently received the degree of Doctor of Science from Villa Nova College, Pennsylvania. Mr. Murray is one of the foremost men in the electrical industry today. He bears the unique distinction of having installed more power plant capacity than any other man. In 1910 the Franklin Institute awarded Mr. Murray the Edward Longstreth Medal for his system of safety devices and protective appliances for interior electric wiring. Altogether Mr. Murray has been granted more than 350 patents, principally for electrical inventions.

R. W. Conlisk, who has recently returned from service in the Signal Corps in which he was finally promoted to the rank of captain, has been employed by the Westinghouse Company to fill the position of illumination engineer in the San Francisco office. Mr. Conlisk is now at the East Pittsburgh plant of the Westinghouse Company becoming familiar with the details of the duties his new position will require of him. Upon his return to the West he will be active in the work of promoting better lighting in industrial plants, many of which are now badly in need of increased illumination. The Westinghouse Company is doing a great part of the work in educating the industrial plants to the value of proper industrial lighting as a means of increasing plant efficiency and output and of decreasing accidents.

Howard H. Bliss, supervisor of the department of vocational education of the state of Nevada with headquarters at Reno, is a recent San Francisco visitor. It will be recalled that Professor Bliss, while in charge of technical instruction of the Extension Division of the University of California, was the author of an extensive series of articles in the Journal of Electricity for home study, which was followed by a broad and widely distributed list of our readers. Mr. Bliss has in preparation another series of interesting articles, the first of which will appear in the Journal of Electricity in the July 15th issue. Central stations, jobbers, manufacturers and contractor-dealers should call to the attention of their employes this forthcoming series because it will prove of unusual helpfulness.

OBITUARY

Mr. Ralph G. Hemingray, president of the Hemingray Glass Company of Muncie, Indiana, died at Covington, Kentucky, May 11th.

Henry C. Doerr, president of the Garden City Electric Company, San Jose, and of the Santa Clara County Builders' Exchange, died at his home a short time ago. He was a director of the Merchants' Association of that city.

Meeting Notices for Electrical Men

(The opening of the San Francisco "Electrical Home," the annual dinner of Pacific Service employes, and the recent Washington, D. C., Conference of Engineers are the prominent events recorded in these pages. The activities of Northwestern contractor-dealers and of illuminating salesmen are also reported.—The Editor.)

Electrical Home Day at Development League

Celebration of the opening of the "Electrical Home" in St. Francis Wood was substituted for the June 14th meeting of the San Francisco Electrical Development League, and the idea of boosting the "electrical home" conception was enforced by all of the speakers. D. E. Harris, sales manager of the Pacific States Electric Company, was chairman of the day and opened the meeting by stating that the electrical home idea was started in a campaign to secure more convenience outlets in the home and that the home now on exhibition in St. Francis Wood was the result of this campaign.

Lee H. Newbert, commercial manager of the Pacific Gas & Electric Company, then traced the development of the electrical home idea on the Coast and went into detail concerning the work of the California Cooperative Campaign in this respect. He gave credit to the San Francisco Electrical Development League for the untiring work committee members have done to secure more complete wiring of homes. The publicity campaign that is being carried on by the League was explained by M. T. Dolman, of the Pacific States Electric Company, who has been assisting W. C. Hopkins, Westinghouse Electric & Manufacturing Company. Mr. Dolman stated that the publicity committee had printed 500 street car cards, 200 window cards, seven bill boards, 5,000 circulars, and had inserted 796 column inches in the newspapers.

On Friday, the opening day of the Home, there were 200 visitors, 400 on Saturday and over 1600 on Sunday, showing that the widespread advertising done by the committee had brought results. Mr. C. C. Hillis, manager of the Electric Appliance Company, made the report of the finance committee and stated that while the jobbers and manufacturers had turned in their contributions complete, the contractor-dealers and central stations had not as yet turned in their quotas. This, he stated, would be in shortly and it might be nceessary to make another appeal for funds as the publicity was more extensive than was at first planned.

R. M. Alvord, General Electric Company, then outlined the system being used at the home for selling the idea and stated that no salesman was allowed to give prices on the various articles on display and that no literature was being given out that was not of a general nature. There was need, he stated, for five salesmen out there each day and asked for the cooperation of the manufacturers and jobbers in furnishing these. He closed by asking that all electrical men who meet the public do all in their power to sell it the "home electrical" idea.

The last speaker was Robert Sibley, editor of the Journal of Electricity and Pacific Coast editor of Electrical World and Electrical Merchandising. He stated that in his visit to the home the idea that most impressed him was that it was not an electrical show but a modern home fully equipped with electrical appliances. In bringing the meeting to a close Chairman E. O. Shreve spoke of the constructive work being done by the Journal of Electricity and stated that the electrical fraternity should show its appreciation of this fact. The meeting closed with a vote of thanks to the members of the League who had worked so hard and given their time so unselfishly towards making this electrical home a success.

BUILDERS OF THE WEST — LXXX

GEORGE E. QUINAN

In the design and in the drawing of specifications for safety control in transmission line installation in the West, an influence has been brought to bear that has been felt throughout the nation, and has again won for this section of the country a place in full keeping with its triumphs of engineering attainment. To George E. Quinan, chief electrical engineer of the Puget Sound Power & Light Company, this issue of the Journal of Electricity is affectionately dedicated in appreciation of his contribution to the development of our industry in the West in connection with safety control in transmission line construction, and for his helpful activities in engineering discussion and Institute affairs in the Northwest.

Oregon Contractor-Dealers Approve the California Cooperative Campaign

The regular bi-monthly dinner and business meeting of the Oregon Association of Electrical Contractors and Dealers was held Monday evening, June 14th, at the Portland Chamber of Commerce.

The evening was devoted to listening to and discussing reports from Messrs. E. L. Knight, C. P. Scott and John Tomlinson covering their trip to Pasadena.

All were enthusiastic over the workings of the California Cooperative Campaign and the recommendations that this association work with and heartily support the Advisory Committee of the Northwest Electric Light & Power Association were warmly received.

The delegation from the Oregon Association presented very complete reports covering the Contractors and Dealers' Convention, the N. E. L. A. Convention and the California Cooperative Campaign and also their observations concerning methods and practives of jobbers and contractor-dealers in California.

A number of central station men and jobbers were present and upon invitation presented their impressions of the conventions and the possibilities of cooperation in the Pacific Northwest. Among those who were invited to address the meeting were A. C. McMicken, P. R. L. & P. Co., J. D. Scott, P. R. L. & P. Co., and George Boring, Pacific States Electric Company.

The Oregon Association of Electrical Contractors and Dealers is in a very healthy condition and is the strongest association of its kind in the Northwest.

Illuminating Salesmen Meet

In line with their policy of so training their representatives that they may most intelligently discuss lighting problems with customers and prospective customers, the National Lamp Company gathered 36 of their agents and sub-

Nearly 900 enthusiastic employes of the Pacific Gas & Electric Company gather for annual reunion and dance.—Photo by Morton & Co.

agents at the Palace Hotel, San Francisco, on the evening of June 15, where they were addressed by Clark Baker, assistant to the general manager for Pacific Coast Division of the National Lamp Division of the General Electric Company, and Wm. M. Rosborough, who occupies a similar position to that of Mr. Baker.

Mr. Baker outlined results of an extensive survey of industrial lighting which proved that practically 40 per cent of industrial plants stood vitally in need of more light which would not only tend to prevent accidents, but would conserve the eyesight of the workers as well as result in a greatly increased production. Mr. Rosborough described in a most interesting way the development of the portable foot-candle meter, which is to lighting what the thermometer is to heating. This instrument, which is being put in the hands of those who are striving to improve the lighting conditions in the factories, stores and homes, is sold at the actual cost to the manufacturers in order that the lighting salesman may be able to show, in a convincing way, the actual results that are obtained through changes in illuminants or rearrangements or better maintenance of those now in service.

Pacific Service Employes' Annual Dinner

The fourth Annual Dinner of the Pacific Service Employes' Association was held at the Palace Hotel on the night of June 17th. Mr. R. E. Fisher, chairman of the association, presided at the dinner and entertainment was furnished by the Pacific Service orchestra and by the cast of the opera which was produced by the association last year. The majority of the directors of the company were present at the dinner and the guests of honor included the Hon. E. O. Edgerton, president of the California State Railroad Commission, and H. W. Brundige of the Railroad Commission. In making his opening address Chairman Fisher said, in part:

"The duty of the company is to see that the employes are cared for in sickness and in health, with some promise of a final reward for continuous, constant and loyal service; to have a better knowledge and acquaintanceship with employes' families and their needs; to provide proper recreation facilities and the opportunity for employes to get together for discussions of the problems involved in their daily tasks. The employes should know more of the business in which they are engaged—not merely perform in a perfunctory manner the tasks alloted to them, but should have a proper vision of what the utilities' service means to the public, and the management should share in some reasonable way with the employes the problems, difficulties and anxieties, as well as the ambitions that confront them in their task.

Mr. John A. Britton, vice-president and general manager of the company, was the next speaker, and he proceeded to introduce the directors of the company, including President Drum, and as each one's name was called he was requested to rise so that he might be recognized by the employes. Mr. Britton finished his speech by thanking all of the members of the association for their cooperative work and asked for the same cooperation in the year to come.

The next speaker was E. O. Edgerton, who stated that the employes of a public service corporation were in reality employes of the public, and he said he did not believe that it was good policy for regulatory bodies to attempt to fix the wages of central station employes. "It is of vital interest to the public," he stated, "that capital be attracted to the public utilities, and to be attracted capital must be afforded a safe and sure and certain return. He then spoke of the reward for efficiency and stated that this reward should not be held out as something to take place in the distant future but to be an immediate reward in the form of promotion or increase in wages. He finished by stating that the shortage of power this year had proved how widely industry and agriculture are dependent upon hydroelectricity for their maintenance and growth and stated that the day was coming when an employe of a public service corporation would be proud of the fact that he was so employed and was rendering the greatest service possible to the public.

After Mr. Edgerton's speech there was a moving picture showing "Pacific Service at Work and Play," being scenes taken at the different power houses of the company and of the activities of the Pacific Service Employes' Association. A prize of $10 had been offered to the employe of the company writing the best words on "Pacific Service" to a popular song. The songs that had been handed in were thrown upon the moving picture screen and the members of the Association

joined in singing the words. The award of the prize was judged by the amount of applause and the spontaneity of the singing of the song. The prize was awarded to Miss Rowe of the Chico district. After this contest the rooms were cleared and the rest of the evening was spent in dancing.

Representatives were present at the dinner from each of the twenty-five districts of the company, from Redding on the north to Fresno on the south and from Drum district on the eastern border of California to San Francisco on the west. There were fully one thousand people present and a great deal of credit should be given to the Pacific Gas & Electric Company for fostering such meetings and giving the employes an opportunity to meet on common ground, together with the officers and directors of the company.

Conference of Engineers

The Conference of Engineers at Washington on June 3 and 4, to formulate a plan for a federation of engineering and allied technical societies, was a notable gathering and the results of the conference should prove acceptable to all who desire to have the importance of the work of the engineer, architect and technologist better recognized than heretofore, and who believe that the members of technical professions should be collectively in position to serve the public and to look after matters of concern to these professions.

The Joint Conference Committee which called the conference is made up of representatives of the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining and Metallurgical Engineers. This committee had prepared a draft of a constitution for a Federation of Engineering Societies which naturally was made the basis of the constitution as finally adopted by the Conference. But other plans were submitted and received consideration by the Conference, which early in its proceedings had resolved that the national organization to be proposed by the Conference should be an affiliation of societies and not a new organization of individual members.

Of these other plans one known as the Alvord Committee plan was submitted by the Board of Direction of the American Society of Civil Engineers, without recommendation. The Alvord Committee, it will be recalled, was appointed by the Board of Direction of the American Society of Civil Engineers to give consideration to the Joint Conference Committee report, and dissenting from the views of the latter, submitted an alternative proposition. It was suggested by this committee—one member dissenting—that Engineering Council as at present constituted should be continued with enlarged powers.

Engineering Council is built up of representatives from the four so-called founder societies and the Society for Testing Materials, the representatives being selected by the governing bodies of these societies. The plan of the Joint Conference Committee differing radically from the Alvord Committee plan, by providing for a representation of local organizations in the national organization, was considered by the Conference to have advantages.

The Joint Conference Committee plan provided for the formation of a body of representatives to be known as "American Engineering Council." On this body local organizations, or local affiliations, and national or regional societies are to have representation on the basis of one representative for the first 100 to 1000 members, and an additional representative for each additional 1000 members or major fraction of this number. This plan provided, also, for an Executive Board of 30 members of which 6 members are the officers of Engineering Council and the other 24 are to be elected, in part, by the national societies, the allotment to the districts and to the national societies to be on the basis of relative membership. The Conference modified his allotment by making the representation on the Executive Board proportional to representation in the Council, thereby increasing somewhat the representation and influence of the local societies in the Council. The committee on constitution and by-laws first resolved to recommend "Confederation of American Engineering Societies," but reconsidered and reported to the Conference "Federated American Engineering Societies," which is the name as finally adopted.

The American Association of Engineers was represented in the Conference by 17 delegates. Their plea that their organization be made the comprehensive all-embracing National organization was not favorably received. Except for this delegation the Conference was unqualifiedly in favor of a federation of societies and even this delegation cast its vote for the Federation of Societies though declining to vote on the plans as finally adopted.

The delegates of the American Association, among other moves, presented a resolution to the effect that provision should be made in the constitution of the new organization for referring all matters concerning the welfare of the individual engineer or technical man to the American Association. This the Conference considered a matter of procedure and referred the resolution to the new National organization.

The Conference was presided over by Calvert Townley, president of the American Institute of Electrical Engineers. His ability and tact as a presiding officer were universally commented on and contributed materially to the expeditious and thorough consideration of the problems before the Conference.

While the outcome of the Conference is necessarily more or less of a compromise, the proposed plan of a national federation of engineering and allied technical societies is as democratic as circumstances will permit and is worthy of a fair trial.

It remains to be said that a federation as now proposed will not interfere with the functioning of the various National Societies. Their work will go on as in the past. All that they are called upon to do is to join in the federated societies and send representatives to American Engineering Council. No method has been prescribed nor suggested for the selection of their representatives. It is left to each member society to determine for itself how its representatives are to be selected.

San Francisco Electrical Development League

John A. Britton, vice-president of the Pacific Gas & Electric Company, speaker of the day at the June 7th meeting of the San Francisco Electrical Development League, introduced Marshall Hale, vice-president of Hale Brothers Department Store, speaker of the day, by tracing the development of merchandising from the time of the ancients down to the present day. Mr. Britton stated that the one thing necessary for the success of a merchant was honest trading that would win and keep the confidence of the people.

The topic of Mr. Hale's address was "Modern Merchandising" and he started by stating that the present conditions were due to high wages, the extravagance of the public and the government, and the scarcity of labor. He went on to say that every article in a house is the product of labor and profit and that the item of labor was approximately eighty-seven per cent while the rest of the cost of an article was profit. Mr. Hale then proceeded to point out the principles of successful merchandising, laying particular stress on the necessity of figuring profit on the selling price of the article and the importance of watching the turnover of the stock. At the conclusion of his address Mr. Hale brought out the necessity for more production on the part of every one and stated that the commission plan on sales or the payment of labor for piece work would add incentive to this.

HAPPENINGS IN THE INDUSTRY

REORGANIZATION OF CALIFORNIA-OREGON POWER COMPANY

A plan of reorganization for the California-Oregon Power Company has been decided upon by the bondholders committee of the company that will mean the formation of a new corporation. The plan is based upon the principle that the holders of five per cent company bonds of 1952 shall become the owners of the properties of the company, subject to the underlying bonds, and that the present common stock shall be eliminated. The new corporation will acquire the properties and assume the liabilities of the present company with the exception of the five per cent company bonds, and bonds of the face value of $4,310,000 have been deposited with the Mercantile Trust Company of San Francisco to be used for the purchase of the new company, in exchange for their bonds; $500 par value in preferred stock and $1,000 par value of common stock being given in exchange for each $1,000 bond plus all unpaid coupons. The new company will authorize a bond issue to provide new capital for improvements, extensions and betterments, and to provide the necessary funds for the expenses of reorganization and the payment of a dividend to non-assenting bond holders. The present underlying bonds will not be disturbed, but suitable provision will be made in the new bond issue for their refunding or exchange.

The company will authorize a bond issue of $10,000,000 on the company's properties, subject to the underlying bonds, and there will presently be issued of these bonds $3,000,000 face value. These will be used as follows:

For the refunding or exchange of underlying bonds	1,158,000
For sale to provide new capital, and to pay expenses of reorganization and dividend to non-assenting bondholders	1,842,000

The reorganization of the company will bring about a reduction in the outstanding securities of over six million dollars.

	Before	After
Underlying bonds	$1,158,000	$1,158,000
Company bonds	4,442,000	
Preferred stock		2,221,000
Common stock	8,283,000	4,442,000
	$13,883,000	$7,821,000

The securities of the company after reorganization will be supported by the properties of the company which at this time have a valuation of $7,433,167.26. To this valuation will be added the value of additions and betterments resulting from the application of moneys resulting from the sale of the new bonds.

In 1918 the gross revenue of the company was $502,-269.05 and the net revenue $257,118.68, while in 1919 the gross revenue increased to $726,079.30 and the net revenue to $406,304.31. Since the first of this year the monthly net revenue has been over forty thousand dollars and the additional capital expenditures made with the funds provided by the sale of the new bonds will add to the electrical generating capacity of the company, and should result in an increase in the earnings of the company.

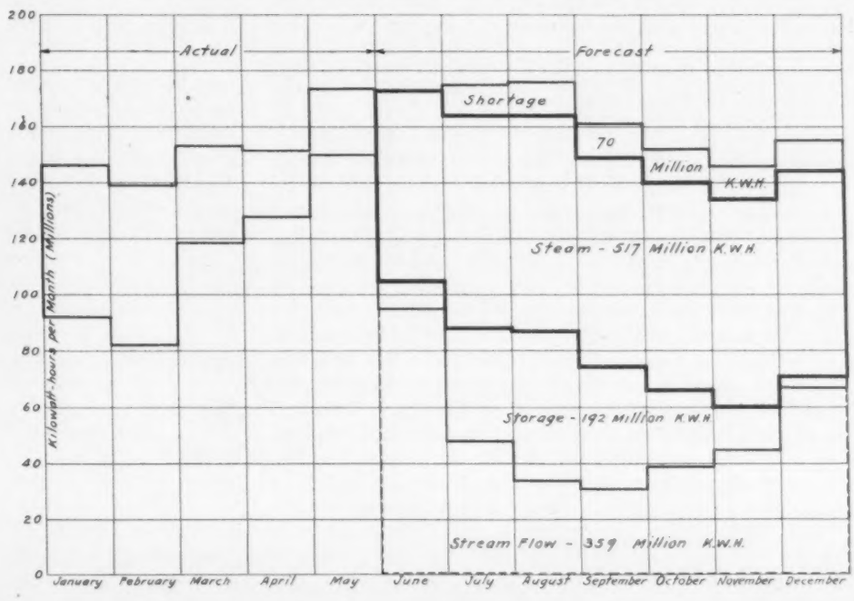
GREAT WESTERN POWER COMPANY ASKS FOR RATE INCREASE

The application of the Great Western Power Company for an increase in the electric rates to be charged over the entire system consisted principally of the submission of exhibits by the company tending to show that an increase in rates is necessary because of increased operating costs.

J. B. Black, sales manager of the power company, explained the exhibits as they were offered. He said that the total receipts of the company in 1919 were $5,055,755. He estimated that the receipts for 1920, based on the present rates, would aggregate $5,114,789.91. In 1919, one of Black's exhibits showed the company's total operating expense and depreciation footed up $2,517,795, giving a net revenue after depreciation of $2,537,960. The same exhibit estimated for 1920 a total operating and depreciation expense of $3,296,928, leaving a net revenue after depreciation, if the present rates are continued, of $1,807,870.91.

Black pointed out that according to the figures submitted by the company production expenses in 1920 would amount to $1,525,268, or $701,950 more than in 1919. The transmission expense in 1920, according to the company's estimate, would run to $151,595, an amount $22,010 in excess

The latest estimates made by the Power Administrator of the California Railroad Commission show a more favorable year for the hydroelectric generating plants of California and the irrigation of the valleys than anticipated a few months ago. The present prognostication indicates that during the months of July to November, inclusive, the shortage of water power will amount to 70 million kw-hr., distributed so that any one month will have not over 10 million kw-hr. shortage. Steam generation will give a total of 517 million kw-hr. during the last seven months of the year.



of the 1919 expense. Distribution expenses would total in 1920 $58,822 more than in 1919. Taxes, said Black, would show a decrease of $48,891, the company's estimate for this item totaling $355,000 as against $403,891 actually paid in 1919.

One of the company's exhibits showed an estimate of 112,737,560 kilowatt-hours of steam generated electric energy in 1920 as against a steam production of 41,757,450 kilowatt-hours in 1919. The same exhibit also showed that the company's hydroelectric production of 373,753,580 kw-hr. in 1919 would drop to 81,309,580 in 1920, due to low water conditions.

ACTIVITIES OF MONTANA RAILROAD COMMISSION

The engineers of the Montana Railroad Commission have for the past year been engaged on work that is in the nature of efficiency engineering, assisting the smaller utilities to readjust themselves to the present condition of high prices. By a study of the plants the commission engineers have found it possible to make recommendations that cut down the overhead expenses of the plant, and by changing operating conditions have made a rate increase unnecessary.

Since August of last year this commission has also been ex-officio the irrigation commission and the engineers have had to supervise the field work and assist in the formation of irrigation districts.

In rate cases the commission causes a physical valuation to be made whenever possible and during the past year valuations have been made of the following plants: Butte Electric Railway Company; Helena Gas Railway and Electric Company; Great Falls Gas Company; Billings Gas Company; Livingston Water Company, and about twenty other smaller water, electric and gas utilities.

Mr. James H. Bonner, chief engineer of the commission, has been making an extended study of the street railway problem and an article is being prepared by him on this subject that will appear in an early issue of the Journal of Electricity. The problems in Montana seem to be the same as those that confront the larger systems, namely, that the number of street car customers is decreasing at such a rate that increased rates do not compensate for the losses.

ELECTRICAL CONTRACTOR'S LICENSE FEE RAISED

The Board of Supervisors of the city of San Francisco have fixed the license fee of the electrical contractors at $100. Heretofore the license fee has been $10 a year, and various attempts were made at meetings of the Board of Supervisors to have the fee fixed at $50 and $75 a year. The larger fee was adopted by a vote of three to one.

SOUTHERN CALIFORNIA EDISON COMPANY STARTS CONSTRUCTION

On account of the immediate need for more power, there has been a departure from the original program of construction of the Southern California Edison Company for its Big Creek Project. The next unit of this development to be installed is the plant known as No. 8. This plant is located in Big Creek Canyon just below Plant No. 2, and will eventually receive the water from the San Joaquin River when the Mammoth Pool Tunnel is completed. It will also use the waters impounded in Shaver Lake after they have passed through the turbines now being installed at Plant No. 2. Bids have been asked for covering the hydraulic equipment, the first unit of which will be a 30,000-hp. Francis turbine to drive a 22,500-kilowatt generator. The plant will operate under a head of 700 feet. The generating voltage will be 11,000 volts and this will be raised to 150,000 volts for transmission to Los Angeles.

An interesting feature of the installation will be the construction of the transformers which are being built for 220,000 volts. It is later planned to change the entire Big Creek system to this higher voltage, as this particular plant can then be brought into service by simply changing the taps on the transformers. Preliminary work has been done on the tunnel and it is expected that a large crew will be engaged in a few weeks, as it is desired to have the new unit in operation for the summer load of 1921. This plant, with the additional machines now being installed in Plant No. 2 and the new plant on Kern River now nearing completion, will give the Edison Company 75,000 kilowatts capacity above what it now has.

IDAHO POWER COMPANY RATE INCREASE

The public utilities commission of Idaho, in a decision announced June 1st, granted the Idaho Power Company a 10 per cent increase over present rates for electric service in the state of Idaho.

In case of new contracts for irrigation service a 20 per cent increase is allowed, and it is pointed out by the commission that the hard law of necessity may demand a further increase on this item after the present year.

COMMITTEE TO CHANGE OVERHEAD CONSTRUCTION RULES

A committee has been appointed to change general order number 26 of the Railroad Commission, bringing it up to date and including in it the requirements of chapter 499 of the statutes of 1911 as amended by chapter 600 of the statutes of 1915. Seven years of experience have demonstrated that certain requirements of the order which relate to line construction should be revised and it is believed by the committee that all orders regarding overhead line construction should be under one cover. At a recent meeting at which all branches of the industry were represented it was decided that to get the best results a small committee should be appointed to carry on the work. The following committee was appointed:

Lloyd Henly, chairman, California Railroad Commission.
S. J. Lisberger, Pacific Gas & Electric Company.
R. E. Cunningham, Southern California Edison Company.
R. W. Mastick, Pacific Telephone & Telegraph Company.
H. B. Bell, San Francisco Oakland Terminal Railways.
F. E. Geigel, Southern Pacific Company.
J. E. Fifield, International Brotherhood Electrical Workers.
Arthur Kempston, Pacific Fire Extinguisher Company.
Carl A. Heinze, engineer electrical distribution, city of Los Angeles.
J. E. Macdonald, secretary, Joint Pole Committee, Los Angeles.

PASADENA TAKES OVER DISTRIBUTION SYSTEM IN CITY

The city of Pasadena has taken over the distribution system of the Southern California Edison Company within the limits of the municipality. This company has been in competition with the municipal plant and to remove this condition the city voted bonds with which to purchase the lines. The purchase price was $533,262.33 and was authorized by the Railroad Commission.

IMPORTANT CONTRACT AWARDED

Los Angeles City, through its Bureau of Power and Light, has recently awarded two important contracts in connection with the further development of the acqueduct power, and with these awards definite steps have been taken for the construction of the San Fernando and Franklin Canyon plants. The General Electric Company was the successful bidder for the electrical equipment and S. Morgan Smith Company for the water wheels.

There will be two Francis type turbines, each of 45,000 horsepower capacity for the San Fernando unit. These will drive two 3500-kva. generators. At the Franklin Canyon plant there will be a 3500-horsepower turbine to drive a 2500-

kva. machine. The General Electric contract includes the complete equipment of generators, transformers, and switchboards.

The Bureau also announces that work will soon be started on a 20,000-horsepower unit connected with a 17,500-kva. generator at San Francisquito Plant Number Two.

CONSTRUCTION OF NEW LINE

Work will begin immediately on the construction of a 60,000-volt line from Green Point, the present terminus of the transmission line from the River Mill hydroelectric plant of the Portland Railway, Light and Power Company, to Station "B," the hydroelectric plant of this company situated at the falls in the Willamette River at Oregon City. A feature of the line will be a 500-foot span supported on steel towers over the Willamette River at Oregon City.

This new line will not only permit an interchange of current between the above-mentioned stations but will supply additional power to the Crown Willamette Paper Company for a new paper machine said to be one of the largest and finest in the country. The machine is equipped with individual motors on the rolls which are so connected and controlled that a change in relative speed of the rolls is impossible, thus preventing breaking of the paper.

HETCH HETCHY CONTRACT DECLARED LEGAL

Petitions to prevent the auditor of the city of San Francisco from paying $276,000 to the Construction Company of North America as the first payment for construction work to be done by that company on the Hetch Hetchy project, were denied by Superior Judge Frank J. Murasky. Judge Murasky stated that the Board of Public Works had full power to award the contract to the Construction Company of North America, and to authorize the initial payment to bind the contract, and that the bond of the Construction Company to carry out the terms of the contract complied with all legal requirements. It was the contention of the tax payers who sought to stop the payment that the Board of Public Works and Board of Supervisors had exceeded their charter's jurisdiction when they awarded the contract to the Construction Company of North America and agreed to make an additional payment before the actual construction work began.

ELECTRICAL MANUFACTURERS' COUNCIL

The Electrical Manufacturers' Council has opened an office in the Fifth Avenue Guaranty Building, 522 Fifth Ave., New York. This office will serve as a headquarters for the Council and its work.

The Council coordinates the work of constituent organizations of the electrical manufacturing industry and its activities have been increased with the development of those organizations and the growth of the industry. The constituent organizations which have representatives on the Council are the Associated Manufacturers of Electrical Supplies, the Electrical Manufacturers' Club and the Electric Power Club.

EIGHT-CENT CARFARE ORDERED BY COMMISSION FOR PORTLAND RAILWAY, LIGHT & POWER CO.

Street car fares in Portland were advanced from 6 to 8 cents on June 15 upon order of the Public Service Commission of Oregon.

Original application for an increase in car fare to meet operating expenses and pay a reasonable return on the investment was made by the Portland Railway, Light & Power Company on August 15, 1919. During the fall a large amount of data was gathered and a thorough investigation of the company's receipts, expenditures and valuation was made. As a result of these studies the Commission came to the conclusion that either greater revenue or less expenses for the company must be provided, and chose the latter method if it could be brought about.

The Commission pointed out to the City Commissioners of Portland the fallacy of imposing upon the company certain public charges, namely, bridge rentals, franchise taxes, car licenses, free transportation to city employes and paving charges, and recommended that the city, through the voters relieve the company of these burdens, and also suggested the purchase of the company's tracks in order to reduce the investment.

The city council declined to submit the proposal to buy the tracks upon advice of the city attorney that it would be unconstitutional, but did submit in the form of three measures the other recommendations of the Commission. These remedial measures were emphatically turned down at a special election, leaving the Commission no alternative but to increase the fare. The operating expenses for the company were shown to have amounted to over $300,000 per month, of which $255,000 is for payroll and $16,000 taxes.

JOBBERS' AND LAMP MANAGERS' SALES MEETING

The Westinghouse Lamp Company in its policy to pursue and create a better cooperative spirit between its own organization and distributors of Westinghouse Mazda lamps, held a conference at its main plant at Bloomfield, N. J., on June 23, 24 and 25th. The subjects which were taken up for discussion were as follows:

The Aims and Purposes of the Jobber-Agents Lamp Managers' Meeting: W. T. Blackwell, assistant commercial engineer. Merchandising of Incandescent Lamps by the Electrical Dealers: S. A. Chase, Westinghouse Electric & Manufacturing Company. General Sales Policies of the Westinghouse Lamp Company: Elliot Reid, sales manager. New Incandescent Lamps and Their Fields of Application: A. R. Dennington, lamp application division. Testing Incandescent Lamps as a Check on Quality: H. S. Dunning, life test department. Engineering and Research Laboratories of the Westinghouse Lamp Company and Their Bearing on the Incandescent Lamp Industry: Dr. R. E. Myers, chief engineer. Industrial Lighting as a Field for Business Building: S. G. Hibben, district illuminating engineer. The Functions of the Branch Agents and Developing a Distribution System: W. W. Briggs, manager New York district office. Value of the Service Record: C. R. Ramsey. The Westinghouse Lamp Company's Plants and New Additions: H. S. Black, assistant general manager. Lamp Transportation Situation: G. C. Clark, transportation manager. How the Commercial Engineering Department Can Aid the Lamp Agent: W. T. Blackwell, assistant commercial engineer. How to Use the Advertising Service: F. W. Prince, advertising manager.

A discussion on Merchandising Incandescent Lamps and Handling Lamp Stocks by C. Beard, sales department, included the inspection of lamp exhibits which were made up of a number of exhibition devices that are used in the various electrical shows and conventions, and also a number of typical window displays for featuring incandescent lamps.

PACIFIC GAS & ELECTRIC BUY MORE WATER RIGHTS

Through the Mount Shasta Power Corporation, which is one of its subsidiaries, the Pacific Gas & Electric Company have sought the permission of the Railroad Commission of California to purchase the property and water rights on Fall river owned by the California Power and Manufacturing Company. Fall river is the principal tributary of Pit river and its main source of supply, and it is claimed by the Pacific Gas & Electric Company that the acquisition of these water rights will make most effective the use of the waters of Fall river and the early development of power on Fall and Pit rivers. The plans of the company call for the development of approximately 400,000 hp. on what will be known as the Pit river development, but which includes power houses on both the Pit and Fall rivers.

SAN FRANCISCO CONTRACTOR-DEALERS MOVE INTO NEW QUARTERS

On account of increased activities and an ever-increasing membership the San Francisco Association of Electrical Contractors and Dealers have moved from the Call Building and taken over the entire top floor of the Journal of Commerce Building, 163 Jesse Street.

BRITISH RAILROAD OFFICIALS INSPECT CHICAGO-MILWAUKEE ELECTRIFICATION

Sir Vincent Raven, chief mechanical engineer of the British railroad systems, accompanied by his chief designer, R. J. Robson and M. Lydal, consulting engineer, all of the London and Northeastern Railroad, have just completed a trip over the system of the Chicago, Milwaukee and St. Paul Railroad. The trip was made for the purpose of inspecting the recently completed electrification as the English railroad is considering the electrification of its lines to a greater extent than ever before. According to Sir Vincent Raven, at the present time there are seventy-four miles of electrified lines and plans have been made to start work at once on the electrification of one hundred and twenty miles of line. The trip over the Cascades convinced the visiting engineers of the efficiency of the type of locomotive used by the Chicago-Milwaukee and without doubt this type of engine will be adopted by the English railroad. The visiting engineers were accompanied by H. E. Byram, president of the Chicago, Milwaukee and St. Paul Railroad, and by H. B. Earling, vice-president of the same line.

IS THIS ANOTHER FAKE ELECTRICAL DEVICE?

Letter to the Editor

Editor Journal of Electricity—Sir:

Referring to the matter of a stock selling scheme at Denver, Colorado, where a new generator is being exploited, alleged to produce twice as much light as any other generator with the same engine or engine power applied, I am pleased to present the following facts for general public information.

I have read a piece of literature put out by the Sethman Electric & Manufacturing Company of Denver, in which among other things it is stated this generator will cut the cost of fuel required for operation in half. The statement is also made that this generator will be universally adopted owing to its economy of operation and installation. If this generator will do one-tenth of what is claimed for it, I am sure you will agree with me that it should receive the recognition of the electrical press. If on the other hand it is a fraud, as I am thoroughly convinced, the electrical fraternity will also be very much interested, as considerable stock has been sold in this scheme, thereby affecting detrimentally the sale of securities in any bona fide electrical venture.

Mr. George H. Sethman, a consulting electrical engineer of Denver, is the inventor of the generator in question. A small shop has been set up on Tremont Street, Denver, in which some ten or twenty old induction motors of General Electric and Westinghouse manufacture have been disassembled and new windings inserted in the stator; the usual squirrel cage rotor has been replaced by salient pole field, and a small exciter made up for each outfit to furnish excitation for this field. It is claimed by the manufacturers that in each phase there is inserted suitable reactance capacity and short circuited coils to so modify the wave form produced by this machine that the first half of each cycle consists of a power impulse, as usual with 60 cycle machines, which takes full energy from the prime mover. It is claimed that with this new generator the last half of each cycle takes no power from the prime mover, but is a surge impulse created by the combination of capacity inductance and short circuited coils in the winding. The current is thus sustained through the electrical devices in its circuit without the expenditure of energy from the prime mover. The inventor, when asked by the writer how energy was again stored up in the inductance capacity and short circuited coil without detracting from the energy output on the next cycle, stated in a whisper that "right there was where Dr. Steinmetz fell down."

A demonstration is given by the inventor every other evening, in which one of the apparently convincing tests is to apply to one of the fields of a stationary machine 60 cycle current from the armature of another machine. By connecting different banks of lamps to different armature conductors on the stationary machine, and slowly turning by hand the field of this machine, the various banks of lamps are slowly lighted in rotation as the field passes by their armature coils. This demonstration is made out to prove that with the new generator in operation, no one light or electrical device on its circuits received energy all the time, thus cutting down the power input of the prime mover.

The generator is driven by a small gas engine which, it is stated, will at the altitude of Denver only carry half the load which is apparently caused by the lamps. Absolutely no instruments are connected into the circuit at any point nor will the inventor allow of such connection. Time and again efforts have been made by various parties, including the writer, to obtain some test at the demonstration room which would actually show the energy input into the generator, but despite numerous promises made by the inventor that proper arrangements would be made for such tests, it has never been possible for any outsider to obtain readings which would be of value in determining the actual merits of the machine.

In the discussion accompanying each demonstration the inventor claims that he is in continual correspondence with Dr. C. P. Steinmetz, and that some time ago Dr. Steinmetz gave him three afternoons for a discussion of the merits of this new machine. It is claimed that on the last afternoon Dr. Steinmetz practically gave up in despair, stating to the inventor that while he could not quite fathom all the mysteries of the machine, yet he could state that it was a most remarkable device. The writer wrote Dr. Steinmetz the above facts, and received a wire as follows from the Doctor himself:

"Never heard of Sethman and know nothing of the alleged facts."

The only installation of one of these machines which the writer was able to find was at Ault, Colorado, a small town which had installed this generator in its municipal pumping plant. The generator was run by belt from a jack shaft, from which were also running two of the city pumps. This jack shaft was driven by a large gas engine and there was absolutely no means of determining how much power was being delivered to the generator by this engine. Notwithstanding this fact, great claims were made by the inventor as to the actual consumption of oil used in driving this engine and generator. About three months ago the writer went up to Ault and made careful tests on one of the circuits running off this machine, using a bank of lamps and instruments which had been carefully calibrated at the Denver Gas & Electric Company's laboratory at Denver. As was expected, there was absolutely no difference between energy input to these lamps at their normal voltage on this new generator and from an ordinary 60-cycle generator at Denver, or on a direct current machine of same voltage.

One laughable claim which has been made by the inventor was that with his generator only 1850 volts were necessary on the primary side of a standard 10 to 1, 2200 to 110/220-volt transformer, thus saving 350 volts, as he said. A small 10 to 1 transformer was taken to Ault by the writer, and of course it was found that 2200 volts was required to obtain 110/220 on the secondary side, even with the new generator and its peculiar wave shape.

The above facts were discussed by the writer with the District Attorney at Denver, and it was finally decided advisable to have the American Institute of Electrical Engineers initiate action against the inventor by confirming and publishing the above facts, thereby interesting stockholders to bring suit in their own behalf against the stock company promoting this scheme. The A. I. E. E. investigated the matter and wrote Dr. Sethman, demanding that he appear before them and explain his machine in detail, and that he allow tests to be made by the Institute, or they would take necessary action to have him expelled from the Institute for unethical conduct. No action was taken by Mr. Sethman which could be interpreted as an endeavor to "make good," and therefore on May 8, at a regular meeting of the Denver section of the A. I. E. E., a petition for Mr. Sethman's expulsion from the A. I. E. E. was signed and sent to the national headquarters. That same evening a letter was read before the Institute from Mr. Sethman; in which it was stated that the Denver section of the Institute had not treated Mr. Sethman properly, and its conduct had been such that he did not care to be associated with them any more, and therefore was sending in his resignation from the Institute.

A large amount of stock has been issued by the company promoting this generator, and from all the information which I have been able to gather, I believe it is conservative to state that at least $100,000 worth has been sold. In fact, it is quite well understood in Denver that some $200,000 worth of stock has been disposed of.

One of the most interesting phases of the investigation which I have made of this scheme is the ease with which such a scheme can be promoted among the more intelligent class of a community. Men who admit that they know absolutely nothing about electricity, and who usually can be credited with acting upon intelligent impulses, have without consultation with any one who understands electricity and its applications, purchased from $1,000 to $5,000 worth of stock in this generator. To put one's good money into the promotion of something about which you know nothing at all, seems to be such a common occurrence these days that several electrical men with whom I have discussed this scheme, have said: "Why bother your head, Smith, about such things? If the suckers don't put their money into this scheme, they will put it into another one, anyway. So what's the use of worrying your head about it?" I have heard the above statements so frequently during the past few months that it occurs to me the electrical press can well afford to bring this matter to the attention of the public. If in the particular case of the Sethman generator the press can be of assistance in running this matter down, and if it is a fake, they will materially assist in the promotion of any new electrical undertakings which deserve our support.

W. C. SMITH,
Transformer Sales Engineer.
General Electric Co., San Francisco.

June 17, 1920.

TRADE NOTES

New Sales Manager —

Schweitzer and Conrand, Inc., manufacturers of high voltage protective and switching equipment, of Chicago, announce that Mr. R. Roth, formerly of Lewis & Roth, Philadelphia, has come into their organization as sales manager.

New Engineering Firm Established —

Cope, Rand, Means Company is the name of a new engineering firm established by T. H. Means, irrigation engineer, and E. L. Cope, consulting engineer, both of San Francisco. Lieut.-Col. L. H. Rand, Engineer Corps, U. S. A., formerly at San Francisco and recently transferred to Camp Dodge, Iowa, also has an interest in the firm. Both Mr. Means and Mr. Cope have long maintained independent offices in San Francisco for consulting engineering work and are very well known throughout the state. Hydraulic and structural engineering is the specialty announced. The offices will be in the Holbrook Building.

Industrial Division Manager —

William R. Marshall has been appointed manager of the Industrial Division, New York office of the Westinghouse Electric & Manufacturing Company, to succeed Harlan A. Pratt, who has resigned to become sales manager of the Atlantic Elevator Company of New York.

Change of Ownership —

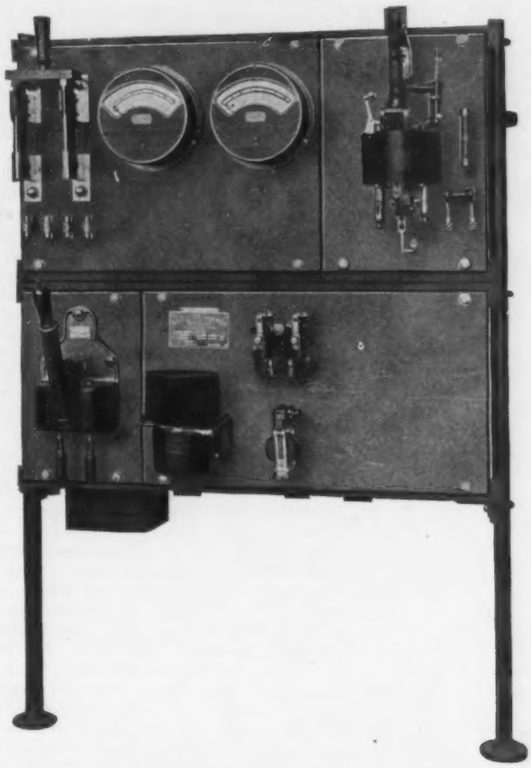
The plant of the Chase-Shawmut Company, Newburyport, Mass., has been purchased by Mr. Sears B. Condit, Jr., president of the Condit Electrical Manufacturing Company, South Boston, Mass.

LATEST IN EVERYTHING ELECTRICAL

(In mines which use direct current from a motor-generator set, the necessity of a switchboard operator can be eliminated by the use of the automatic control panel described on this page, since this makes possible the control of power from some remote point.—The Editor.)

AUTOMATIC CONTROL FOR MOTOR-GENERATOR SETS

In mines and other places where the direct current supply is obtained from a motor-generator set, it is frequently advantageous to control the power equipment from some remote point, thus eliminating the necessity of an attendant at the switchboard. Several mines are using with their motor-generator sets an automatic control panel, shown in the illustrations, which has all the protective features used in the small modern switchboard, and may be controlled from any remote point by means of an ordinary snap switch.



View of the board from the front, showing the circuit breakers and the oil switches, which consist of an operating magnet of the clapper type which is mounted on the supporting frame of the switch and drives the switch mechanism by means of a connecting rod extending through the top of the case.

This automatic equipment, which is manufactured by The Cutler-Hammer Manufacturing Company, consists of the necessary circuit breakers, switches, relays, fuses and recording instruments mounted on slate panels carried on a floor type frame. The primary equipment of the control panel shown in the illustrations consists of a hand operated oil circuit breaker provided with inverse time overload attachments, a phase failure and phase reversal relay, and an automatic starter of the auto-transformer type. This is to be used with induction motors, but the same general equipment with a few slight changes can be used with motors of the synchronous type. On the direct current side a knife switch, voltmeter and ammeter with the necessary fuses, and an automatic reclosing circuit breaker are provided.

With the remote control switch "on" the controller may be operated by merely closing the main line oil circuit breaker, or the breaker may be left closed and the equipment operated by means of the remote control switch. The closing of the main circuit breaker effects the closing of the phase failure and reversal relay, unless one or more of the phases are open or reversed, in which case the abnormal condition must be removed from the line before the relay will close. This relay has also the characteristics of a voltage relay, so the equipment will not operate if the line voltage is very low. After the relay closes, the automatic starter connects the motor through an oil switch to the low-voltage taps of an auto-transformer. When the equipment has come up to speed, the oil switch opens and a second oil switch connects the motor directly to the supply line, at the same time completing a circuit to the closing coil of the automatic reclosing circuit breaker, which immediately closes, establishing the generator voltage on the direct current feeders. In case of an overload on the direct current side, the circuit breaker opens, and recloses when the overload is removed. The oil switches used on this equipment consist of an operating magnet of the clapper type which is mounted on the supporting frame of the switch and drives the switch mechanism by means of a connecting rod extending through the top of the case. Both the stationary and moving contacts of the switch are carried on square insulated shafts and are easily accessible.

These control panels can be furnished in different capacities up to 300 kw. and, when so desired, can be built for operating two motor-generator sets in parallel.

BOOKS AND BULLETINS

The Engineering Index

One of the most useful and satisfactory of annual technical publications is the Engineering Index, the 1919 volume of which has just been issued. As a complete guide to the engineering literature of the year, it supplies a very definite need in the technical world, and its data is so arranged as to be accessible for easy and immediate reference.

This volume contains over 12,000 references to nearly 700 engineering and allied technical publications. It is thus a comprehensive guide to the engineering literature of 1919 and a book of considerable value to members of the profession.

Book on Water Power

A book on "Water Powers of Great Salt Lake Basin" is being compiled by Ralph S. Woolley, engineer of the United States Geological Survey. This is said to be the first book of its kind ever published. It will cover in detailed description the factors entering into the proper utilization of streams in Salt Lake and other valleys.

More than 60 per cent of the field work in connection with the gathering of the data has been done by Mr. Woolley, and nearly 15 per cent has already been written. It is expected that it will be completed this summer, after which it will be placed on file throughout the country as a reference on the Great Salt Lake basin. This book will contain a complete report of every stream, as to water power possibilities.

NEW ELECTRICAL DEVELOPMENT

(The Northwest reports plans for the construction of an enormous industrial plant on the Columbia river as a result of the signing of the water power bill, and also the construction of a power house in British Columbia, where 400,000 hp. will be developed. An encouraging report concerning water in the big Lake Spaulding reservoir is among other Pacific Central items and municipal purchase of an electrical distribution system is reported from the Southwest. Intermountain items contain reports of new power line construction, the installation of electrical mining equipment and plans for improved street lighting.—The Editor.)

THE PACIFIC NORTHWEST

TACOMA, WASH.—The council has passed an ordinance calling for street lamps on concrete posts on North 26th Street.

TACOMA, WASH.—The final step has been taken in authorization of the Lake Cushman power project, an ordinance having been introduced for condemnation of the property required.

KLAMATH FALLS, ORE.—Reorganization of Oregon-California Power Company will include floating a $10,000,000 bond issue of which $1,842,000 will be disposed of at once for improvements.

BELLINGHAM, WASH.—The Puget Sound Power & Light Company is to start at once laying double track on Cornfall avenue and doing other work in the nature of paving and so forth, at a cost of about $40,000.

TACOMA, WASH.—The building of the Tacoma Railway & Power Company has been damaged by fire to the extent of $60,000 and the heating plant of the Tacoma District Heating Company was also damaged to approximately the same extent.

KLAMATH FALLS, ORE.—The land owners of the Klamath Drainage District have instructed the directors to authorize the issuance of $200,000 in bonds for the construction of a drainage system for the 20,000 acres of land in the district. The bonds bear 6 per cent interest, and extend over a period of 15 years. The first $10,000 will be retired in five years.

SEATTLE, WASH.—Construction of two subways and an elevated trestle in the downtown district and reduction to a minimum and possibly the entire elimination of operation of surface cars in the business section of Second and Third avenues are features of recommendations soon to be made to the mayor and city council by the city engineering department.

SEATTLE, WASH.—Decision was reached by the council utilities committee to call upon the city engineer for a report as to the feasibility and safety of the plan submitted by Superintendent of the Lighting Department J. D. Ross, to develop hydroelectric power at Cedar Lake by construction of an 8500-ft. tunnel from the bottom of the lake to the power plant on Cedar river.

MEDFORD, ORE.—Bolen Creek Mining Company has filed application with the state engineer for permission to appropriate ten second-feet of water from Sucker Creek for the development of power for manufacturing lumber for power purposes. Canals, pipe line, water wheel and six miles of flume will be required. The estimated cost is $8,000. Work is to start on October 1.

SEATTLE, WASH. — Declaring that many Seattle industries and most of 63,000 consumers of city light will be without electric current at the end of 40 days unless additional fuel oil for the Lake Union steam power plant is obtained, Superintendent J. D. Ross on June 19 asked the United States Shipping Board to furnish a tanker for use in transporting oil to Seattle for the city's use.

VANCOUVER, B. C.—Calling for the eventual expenditure of $30,000,000, development of Bridge river power site near Lillooet is in its initial stages, surveying and preliminary work now being under way. Plans call for a tunnel one and one-half miles long under Mission Mountain, discharging into Seaton Lake. The fall will be 1400 feet and the estimated horsepower to be developed is 400,000.

SPOKANE, WASH.—One of the largest projects of the West which will be developed as a result of the signing of the water power bill by President Wilson will be at Priest Rapids on the Columbia river in Washington, where H. J. Pearce and associates are planning to install an industrial plant. Initial investment will be $5,000,000 but it will require three times this amount before the project is completed.

SEATTLE, WASH.—Seven-cent car fare has become effective on the Rainier Valley street car lines inside the city limits by order of the State Public Service Commission. The new schedule also includes elimination of commutation tickets to Renton, which have formerly been sold at the rate of two for 25 cents. The fare to Renton is now 15 cents straight. Fifteen-ticket tokens will be sold for $1.00 but do not carry with them the transfer privilege.

SEATTLE, WASH.—The city council adopted Councilman William Hickman Moore's ordinance authorizing and directing Mayor Caldwell to investigate the $15,000,000 traction deal and appropriating $10,000 to defray the expense of the investigation. The ordinance was passed with an emergency clause attached, in which form approval by the mayor will be necessary in order to make the measure effective. Under the ordinance as passed, Mayor Caldwell will have free reins and the support of the council in his investigation of the negotiations leading up to the traction purchase.

SPOKANE, WASH.—Light and power rates to commercial users who use but a small amount of electricity are to be raised 50 per cent, according to a letter received by Mayor Fleming from the Public Service Commission. The proposed new schedule would become effective on July 15. Mayor Fleming indicated that there would probably be no protest to prevent the new rates going into effect as but few industrial users of power are concerned. Private homes are not concerned in any manner in the proposed increase. The rate affects all commercial accounts, including those of mercantile establishments, offices, public buildings, board and rooming houses and apartments where there is a master meter for all tenants. In commenting on the change Mayor Fleming said: "Unless something special comes up in regard to the change, we will not protest it. If those affected make a complaint it might be necessary to contest the proposed raise. However, unless this is done, it will go into effect. It is probable that there are too few affected to make a fight worth while when it is probable no results for the better could be gained by protest."

SEATTLE, WASH.—Mayor Hugh M. Caldwell of Seattle has signed the ordinance providing for a 6¼-cent and a 10-cent fare on city street cars, making the bill effective Monday, July 19, thirty days from the date of his approval. Although originally passed by the city council on July 14 as an emergency measure, to become effective on the Mayor's approval, Corporation Counsel Walter F. Meier has ruled that as it stands, it cannot become a law until a month has elapsed. The new fare provides for the following rules on city cars: Ten cent cash fare; seven and one-half cent cash fare for each of two persons riding together; six and one-quarter cent metal tokens, each good for one fare, to be sold on all cars in lots of four for 25 cents, 8 for 50 cents, 16 for $1, but not singly; free transfers with cash or token fares; three-cent fares for school children, except that two may ride for a nickel; ten school tokens for 25 cents. According to estimates prepared by General Superintendent D. W. Henderson of the street railway, the advance fares will result in an additional revenue of $123,190 a month or $1,478,280 a year, for the street railway. A supply of 2,000,000 metal tokens was ordered last week at a cost of $17,000 and is now being made by Joseph Mayer Brothers, Inc., who agreed to furnish them in lots of 50,000 a day within three weeks.

THE PACIFIC CENTRAL DISTRICT

SAN FRANCISCO, CAL.—All but a small fraction of the Pacific Gas & Electric 7 per cent bonds have been sold.

MADERA, CAL.—F. M. Carter, recently with the Happy Valley irrigation district, has been appointed resident engineer for the Madera irrigation district.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company declared its usual quarterly dividend of 1¼ per cent on common stock of record June 30, payable July 15.

VALLEJO, CAL.—The Vallejo Electric Light and Power Company has purchased the property opposite the new Virginia theater, known as lot 11, block 283. It is the plan of the electric company to erect a modern three-story electric light office building.

NAPA, CAL.—The city council passed a resolution authorizing the mayor and city attorney to negotiate with Oliver Hoffman for the purchase of his water rights in Milliken canyon, and to acquire his real estate known as the "Old Murray Place." This means Napa will have a municipal water plant.

REDDING, CAL.—The strike of electrical workers in the shops of the Pacific Gas & Electric Company, which was declared on May 27, ended when the foreman announced 36 of the strikers had returned to work. The balance of the men who quit are expected to return directly.

RED BLUFF, CAL.—A decision to submit a proposition for municipal ownership of the water system to the voters here was reached at the meeting of the city council recently. The movement follows in the wake of a raise in rates granted to the Antelope Creek and Red Bluff Water Company.

SAN FRANCISCO, CAL.—The Railroad Commission authorizes the East Bay Water Company to dispose of approximately 2000 acres of land in Contra Costa county owned by the company, but not needed in the operation of its water plant. The land is located in the vicinity of Pinole and San Pablo.

STOCKTON, CAL.—Provident Irrigation District emergency steam plant of 2,000 hp. capacity, to meet the power shortage of this summer in California, has been put into successful operation after a remarkably short time for construction work, which commenced April 1, 1920.

The plant is modern and complete in every respect and has been designed and installed under the direction of R. W. Van Norden, consulting engineer, and Leonard F. Yondall, contractor of Stockton, California.

MARYSVILLE, CAL.—A ranch completely operated by electricity is to be found in Garden valley at Camptonville, near here, according to Frank Gates, local Y. M. C. A. secretary, who returned from that place, where he has been preparing to establish the Y. M. C. A. summer camp. It is the ranch of Harold Nelson. Gates declared Nelson has all the machinery on the ranch operated by electricity, and that his home and outbuildings are brilliantly lighted. The power is obtained from a dynamo operated by a mountain stream.

SAN FRANCISCO, CAL.—Complaining that the Western Gas & Electric Company has invaded territory claimed by it, the Pacific Gas & Electric Company requested the Railroad Commission to forbid the Western company from constructing a 2300-volt service line in the so-called "Boggs Tract," west of the city of Stockton. The Pacific company alleges that the privilege of occupying this field of service was originally granted to the Oro Electric Corporation, which has been assimilated by the Pacific Gas & Electric system.

ALTA, CAL.—Notwithstanding all predictions of water shortage and drought which have been freely circulated, there now appears to be sufficient water impounded to furnish the normal demand this season. According to W. J. Eddy, superintendent of the Pacific Gas & Electric Company's ditches and reservoirs in the Drum district, the storage reservoirs at Lake Spaulding were spilling from May 20th until the early part of June. Eddy says the supply of water is as abundant as that of last year, and should last until late in October.

SAN FRANCISCO, CAL.—A complaint has been filed with the Railroad Commission by the city of Stockton against the Southern Pacific Company, Western Pacific Railroad Company, Santa Fe and the Stockton Electric Railroad Company asking that the railroad companies be required to build subways at a number of points in the city of Stockton. The complaint announces the purpose of the municipal government of Stockton to make preparations for a greater growth of the city by clearing the arteries of transportation of many grade crossings that at present involve delay as well as danger.

MADERA, CAL.—A dam for the Madera irrigation district will be designed by Louis C. Hill of the firm of Quinton, Code & Hill of Los Angeles, it was decided at a meeting of the directors of the district held recently with Mr. Hill and Thomas H. Means present. In the conference Mr. Hill again referred to the enormous cost of development which will result from the dam. He pointed out that the development of this power alone would justify the building of the dam if not a drop of water was to be used for irrigation purposes. From now on the work of development of the project will move rapidly.

SAN FRANCISCO, CAL.—Resolutions condemning the using of water from Lake Tahoe for irrigation purposes have been adopted by Pacific Parlor, No. 10, of the Native Sons of the Golden West. Copies of these resolutions are being forwarded to United States Senators and members of Congress and to magazines and newspapers throughout the country. The protest emphasizes the fact that there is an ample supply of water in this state for irrigation and power development without commercializing the beauty spots of California or lowering the water supply of natural wonders, which are being preserved for the public.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—Los Angeles Gas and Electric Company has been authorized by the Railroad Commission to issue and sell $1,500,000 of its first and refunding mortgage 5 per cent bonds, due September 1, 1939.

PHOENIX, ARIZ.—The Salt River Valley Water Users' Association have passed a resolution authorizing the president of the association to enter into contracts with valley farmers to supply them with electricity wherever they will form into a district for community utilization of power.

LOS ANGELES, CAL.—A breakdown of some of the hydroelectric machinery at the Big Creek plant of the Southern California Edison Company near Huntington Lake, 20 miles east of Fresno, caused a 25-minute interruption in street car service on the lines of the Los Angeles Railway on June 22. A report that the trouble at the power plant was the result of a trembler was denied at the general offices of the Southern California Edison Company's plant.

TUCSON, ARIZ.—The electric district, organized for the distribution of power throughout the new pump irrigation area lying between Yuma and Dome, is rapidly becoming an accomplished fact. Pole lines are up, and the heavy copper transmission wires are being strung. Many wells and a few pumping plants are in readiness. More wells are being drilled and many pumps and motors have been contracted for. This is the first district organized under the electric district law passed by the last legislature.

PASADENA, CAL.—Transfer of the electrical distribution systems of the Southern California Edison Company in the city of Pasadena to the municipality for a consideration of $533,262.33 was authorized in an order issued by the Railroad Commission. The deal by which the city was to remove its chief competitor to its municipal electric system has been in progress since April, 1918, and since that time Pasadena has bonded itself to provide the money for the purchase of the Edison system. The commission authorized the company and the city to execute the final agreement of sale.

PHOENIX, ARIZ.—Power from the Sierra Nevada Mountains of California is being used for the irrigation of ranches in the South Gila valley, ten miles east of Yuma, according to advices received at the Phoenix Chamber of Commerce. At present the largest development in this section is that of the 640-acre ranch of J. H. Maxey. But it is reported that within the next two years 20,000 acres will be under cultivation there. Cotton will be the crop. It is reported as a plan for the near future that this Sierra Nevada power will be extended to Gila Bend and thence to Ajo to supply electric energy to the New Cornelia and other mines of the Ajo district.

SANTA MARIA, CAL.—The Santa Maria Gas Company has been authorized by the Railroad Commission to acquire all properties of the Santa Maria Gas and Power Company and certain properties of the Midland Counties Public Service Corporation. According to the decision, the Santa Maria Gas Company is authorized to issue $300,000 of stock, $408,000 of 6 per cent 20-year bonds and $82,000 of 6 per cent three-year notes to close the deal and unite the properties under one management. In acquiring the property of the Santa Maria Gas & Power Company the new company is to assume all the indebtedness of the old company and in addition to issue the old company $300,000 of the new company's capital stock.

THE INTER-MOUNTAIN DISTRICT

BONNERS FERRY, IDA.—The matter of installing a lighting plant to cost about $50,000 is being considered by the city council.

RUPERT, IDA.—Work is to start at once by Burley Electric Company on a new power line to be constructed north and west of town.

LOGAN, UTAH.—The 1000-horsepower irrigation pumping plant of Skeen & Skeen at Cache Junction is expected to be completed and in operation the first part of July.

HYRUM, UTAH.—The Hyrum municipal corporation has filed with the state engineer an application for the purpose of diverting one-half cubic foot of water from an unnamed spring in Cache county, the water to be used for power purposes.

SALT LAKE CITY, UTAH.—The topographical survey which was ordered by the U. S. Government in the various canyons in this vicinity is now in progress. This survey is for the purpose of determining the water possibilities and the probable power sites along a great portion of the western slope of the Wasatch Mountains. It will eventually take in most of the canyons from Ogden to Nephi.

BRIGHAM CITY, UTAH.—Negotiations have been completed whereby the Reclamation Power Company, which has a filing on the waters of Boxelder Creek at the highest point in Boxelder Canyon for power purposes, agrees to transfer all its right, title and interest, together with a right-of-way for pipe line and certain improvements already made on the pipe line to Brigham City for the sum of $5,000.

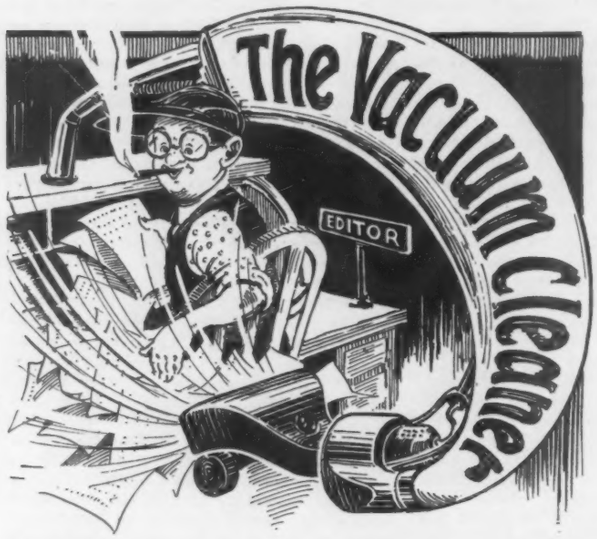
EUREKA, UTAH.—The Griggs-Huish Leasing Company has recently installed electrical equipment for the operation of their mill. This concentrating mill will handle large quantities of low-grade ore, as well as many thousands of tons of dump material which is valuable enough to be milled at a profit. The new mill has a capacity of 150 tons of ore per day, and on dump material, which will not require so much crushing, the capacity can perhaps be increased to nearly 200 tons.

POCATELLO, IDA.—The Ashton-St. Anthony Power Company won a decision in the district court at Blackfoot, Idaho, a few days ago, when the court refused to grant the petition of the Mackay Light & Power Company for a writ of review in a controversy which arose between the two electrical companies in the matter of furnishing electric power to the town of Arco. The town of Arco has entered into a contract with the Ashton company to furnish light for the municipality, and in a few days the line will reach that place.

OGDEN, UTAH.—Home gardeners are reported to be testing out pumps and other devices to get water to take the place of water from the city mains, use of which will be forbidden after July 1st by the city authorities to conserve the supply for household and industrial use. While some simple hand pumps have been installed by enthusiastic growers, others mechanically inclined have installed electric power for experimental purposes. Many by these means hope to carry through their plantings and reap the harvest of their labors.

SALT LAKE CITY, UTAH.—Definite action has just been taken by the city commission toward the creation of three new lighting districts that will give to three streets such lights as Main Street now has through the business district. The city attorney has been instructed to draw the necessary resolution to provide for the publication of notice of intention to establish the new districts. The systems will be the same as that on Main Street in lighting power, the difference being only in the standards, each of which will carry three lights, as do those on Main Street.

EUREKA, UTAH.—Rapid progress is being made by the Tintic Standard Mining Company in the construction of its new concentrator at Warm Creek, immediately east of Goshen. With a force of more than 200 men it is expected that the mill will be ready for operation by early fall. Two large transformers are now being placed in position on the hillside, and it will be a matter of only a short time until electric power will be available for operation of the tram, now under construction, to elevate minerals and supplies to the site of the mill, the foundations of which are now being set in concrete. Electric power is to be used extensively in all the mill operations.



Our Oriental residents are showing increased, more or less intelligent interest in the way this country is run. The following letter received by a Western editor is significant:

Dear Sir: What I write you please put in your Safety Valve. I am good, honerable Japanese boy, same as rest. I do good and spend money for industrios. Japanese boys good fellers, work and never do crime. Some people Sacramento try laws make agains Japanese always. Commissioner Cametti don't like Japanese much. Lots American do bad—steel, rob and do vice. I want no please why police don't arrest lot bad Americans and let Japanese lone. One Washington man, Thomas Marshall, President of the vice, i motion Grand honerable jury try him and stop it. Lots other Japanese boy think with me. SHUMATE OMUKI.

* * *

Decisive refusals do away with all danger of backfire from the urgent agent. A bookseller recently had an "account rendered" returned to him with the following reply scrawled across the bill:

"Dear Sir: I never ordered this beastly book. If I did, you didn't send it. If you sent it, I never got it. If I got it, I paid for it. If I didn't I won't. Now you go hang yourself, you fathead. Yours very respectfully, John Jones."

* * *

An income often proves to be more trouble than it is worth. Why not, like Casey, be happy in the joys of freedom?

Michael: "An' phat are yez doin' wid thot incoom-tax paper, Casey?"

Casey: "Oi'm thryin' to figger out how much money Oi save by not havin' anny."

* * *

House hunting is rapidly becoming a serious matter in Western cities. One must ever be watchful for the golden opportunity.

Policeman, to prisoner who has just been sentenced to six months: "Excuse me, but do you want to let your house?"

* * *

THE LAST CHARGE

"Charge!" the young man said in haste,
'Twas reckless he knew well.
But no one stirred or moved a hand,
Upon deaf ears it fell.
It sickened him—he knew the cost,
As o'er him crept a fear;
His senses numbed—then came a voice:
"Your credit's no good here."

WM. S. ALLEN.

THE LAST VETERAN

Shoes at fourteen dollars,
Suits at sixty flat;
Quarter each for collars,
Seven bucks a hat.
Overcoats a hundred,
Milk two dimes a bowl,
Swiftly are we sundered
From our banking roll.
Highballs—swallowed stealthy—
Half a bone a nip;
Golf is for the wealthy,
So's the railroad trip.
Sodas gone to double,
Tax on movie shows,
Figuring's no trouble
Where the money goes.
Rents up aviating,
Smokes a nickel rise,
Carfares extra rating,
Added jits for pies;
Wartime scales are noble,
Sherman rang the bell—
When do we demobil-
Ize the H. C. L.? —E. S. MACKIE.

* * *

In Peru the natives have an interesting habit of utilizing the poles of the electric lines to cultivate the famous gugyaya moss which is fed to pet la Hyian goats. The milk obtained from these goats is used in the making of a cheese which is noted for its high ultimate strength.

* * *

Figures don't lie but some liars figure.

* * *

Among the most practical of electrical appliances is the electric curling iron which is shown in its most useful capacity above. Any who are skeptical of the value of this appliance may read of its less important uses on page 37 of this issue of the Journal.